February 16, 2005

Biological Opinion for the Environmental Assessment/Habitat Conservation Plan for Issuance of an Endangered Species Act Section 10(a)(1)(B) permit (TE-078366-0) for Incidental Take of the Houston Toad (*Bufo houstonensis)* by Aqua Water Supply Corporation, Lower Colorado River Authority, Bluebonnet Electric Cooperative, Inc., and Austin Energy During the Routine Maintenance and Repair of Facilities and Installation of New Facilities in Portions of Bastrop and Lee Counties, Texas

1.0 INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion regarding the issuance of an Endangered Species Act of 1973, as amended, (Act) section 10(a)(1)(B) permit. The federal action under consideration is the issuance of a permit authorizing the incidental take of the federally listed endangered Houston toad (*Bufo houstonensis*) under the authority of sections 10(a)(1)(B) and 10(a)(2) of the Act. Aqua Water Supply Corporation (Aqua), Lower Colorado River Authority (LCRA), Bluebonnet Electric Cooperative, Inc. (BEC), and Austin Energy (AE) (collectively, the Utilities) have submitted an application for an incidental take permit under the Act for take of the Houston toad. An Environmental Assessment/Habitat Conservation Plan (EA/HCP) has been reviewed for mitigation acceptability and National Environmental Policy Act (NEPA) compliance. The implementing regulations for Section 10(a)(1)(B) of the Act, as provided for by 50 CFR 17.22, specify the criteria by which a permit allowing the incidental "take" of listed endangered species pursuant to otherwise lawful activities may be obtained. The purpose and need for the section 10(a)(1)(B) permit is to ensure that incidental take resulting from the proposed routine maintenance and repair of facilities and installation of new facilities in portions of Bastrop and Lee counties, Texas, will be minimized and mitigated to the maximum extent practicable, and that the take is not expected to appreciably reduce the likelihood of the survival and recovery of this federally listed endangered species in the wild or adversely modify or destroy its federally designated critical habitat.

The five federally listed species identified within this EA/HCP include the endangered Houston toad (and its designated critical habitat), endangered interior least tern (*Sterna antillarum*), endangered whooping crane (*Grus americana*), threatened bald eagle (*Haliaeetus leucocephalus*) and threatened piping plover (*Charadrius melodus*). The Houston toad is the only federally listed species that is likely to be impacted by the proposed action, and therefore is the only species to be included on the proposed permit. The interior least tern, whooping crane, and piping plover are likely to only occur within the proposed permit boundary briefly during their annual migration but any impacts to these species are unlikely. Additionally, the Utilities have included specific steps that will avoid and minimize to insignificant the potential for impacts to the bald eagle. Because of this, the Utilities believe take coverage for the bald eagle is not necessary.

Another federally listed species, the endangered Navasota ladies'-tresses (*Spiranthes parksii*) may also occur within the proposed permit area. Based solely on morphological identification, this species was recently discovered in Bastrop and Lee counties. The Service was notified of the Bastrop County population in September 2004. This population is located on property owned by

the University of Texas (Stengl "Lost Pines" Biology Station). The Lee County population was identified in October 2004 along a county road near the Bastrop/Lee County line. After further examination by Service botanists, it appears the Lee County population is likely Nodding ladies'-tresses (*Spiranthes cernua*). Further genetic work is underway, and will confirm their true identification. This confirmation will likely occur after issuance of this permit.

This biological opinion is based on information provided in the Utilities EA/HCP, Houston Toad Recovery Plan (USFWS 1984), Navasota ladies'-tresses Recovery Plan (USFWS 1984), field reviews, expert reports, and other sources of information. A complete administrative record of this consultation is on file at the Austin, Texas, Ecological Services Field Office.

2.0 CONSULTATION HISTORY

The Utilities have a long history of working cooperatively and productively with the Service to comply with the Act, and to protect the endangered Houston toad. In an effort to further enhance this relationship and protect the Houston toad, approximately four years ago the Utilities began actively participating with Bastrop County and others in an effort to develop the Bastrop County Lost Pines Habitat Conservation Plan and obtain an incidental take permit. The anticipated Bastrop County permit would authorize take of the Houston toad associated with a multitude of activities, including activities preformed by the Utilities. After a year of this effort, the Utilities decided to develop an EA/HCP and apply for an incidental take permit that would be tailored specifically to their needs. As a result, the Utilities submitted a preliminary draft EA/HCP dated April, 2002, to the Service. The Service provided comments and the document was revised. A second draft and third draft were submitted to the Service on October 22, 2002, and July 03, 2003. Further comments were submitted to the Utilities and the EA/HCP was revised to produce a draft EA/HCP that was submitted to the Regional Office (RO) on October 07, 2003. The RO and Solicitor provided additional comments on November 24, 2003. The EA/HCP was again revised to produce a final draft. The notice of availability was published in the *Federal Register* on July 2, 2004. The 60-day public comment period closed on August 31, 2004. The Utilities are still participating as a stakeholder in the Bastrop County Lost Pines HCP effort.

3.0 DESCRIPTION OF THE PROPOSED ACTION

The Utilities voluntarily submitted an application for a section 10(a)(1)(B) permit that would authorize incidental take of the endangered Houston toad during otherwise lawful activities to be conducted over a 30-year period in portions of Bastrop and Lee counties, Texas. The Utilities desire to be fully covered under the Act for any incidental take of the Houston toad that may occur as a result of their activities, and to reduce their risk of liability as they conduct various activities. The Utilities propose to avoid and minimize impacts to the Houston toad, and mitigate for any remaining impacts as described in Section 6 of the EA/HCP.

The proposed area to be covered by the permit (proposed permit area) includes approximately 142,526 acres (57,679 hectares) within central, eastern, and northern Bastrop County (106,953 acres [43,276 hectares]) and western Lee County (35,573 acres [14,396 hectares]) (Figure 1).

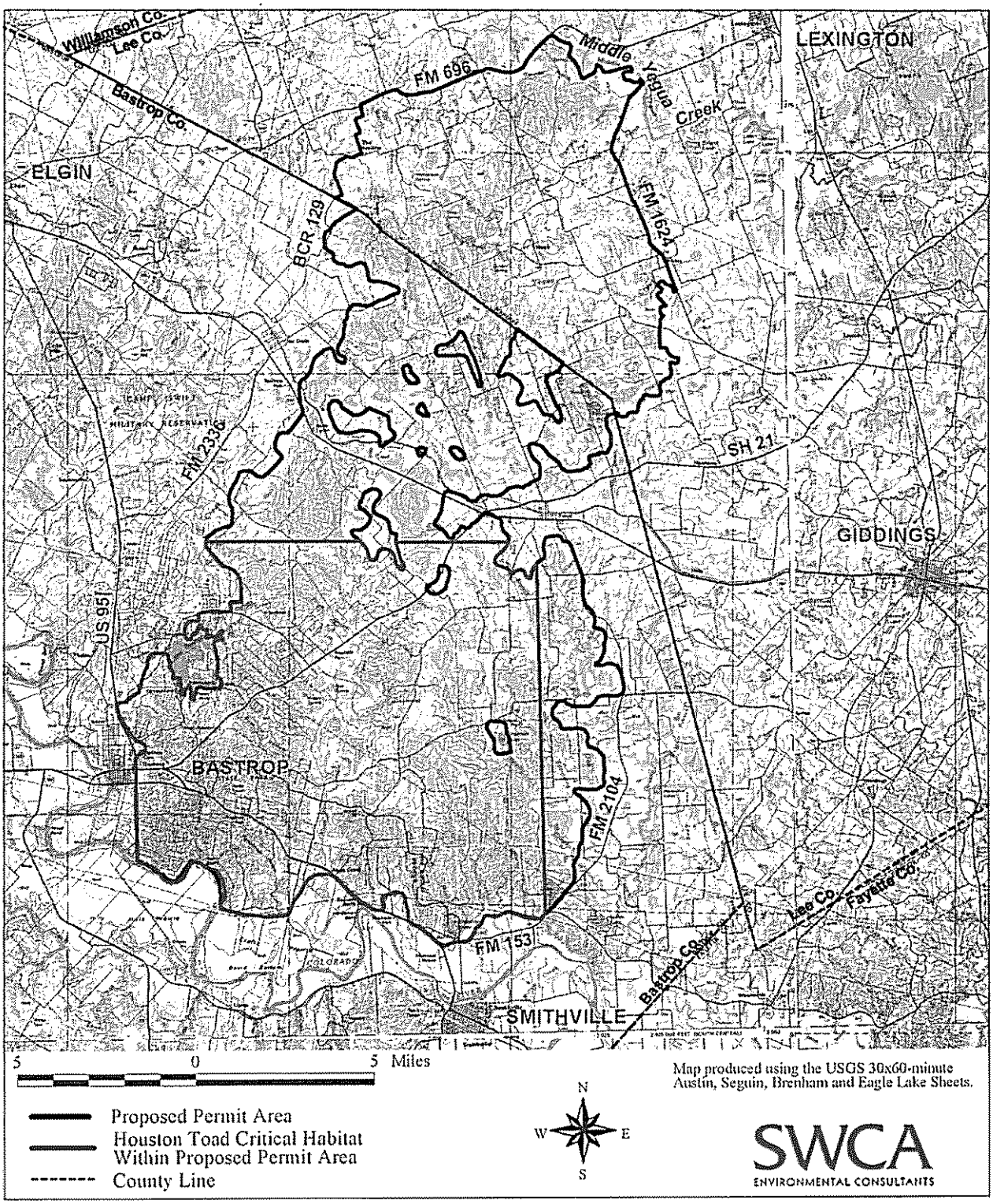


Figure 1. Proposed Permit Area, Bastrop and Lee Counties, Texas.

Within the proposed permit area, covered activities may occur on approximately 6,792 acres (2,740 hectares) (approximately 4.8 percent of the proposed permit area). Approximately 67,214 acres (27,201 hectares or 47.2 percent) of the proposed permit area in Bastrop County is designated critical habitat for the Houston toad and approximately 75,312 acres (30,478 hectares) (52.8 percent) of the proposed permit area lie outside of designated critical habitat for the species.

The proposed action is the issuance of a 30-year permit under section 10(a)(1)(B) of the Act to authorize incidental take of the Houston toad within the proposed permit area by the Utilities performing routine business activities. Their routine activities include, but are not limited to, maintenance, repairs, upgrades, and new installation of linear and fixed foundation facilities. The Utilities cooperatively developed this alternative in order to provide tangible conservation measures for the Houston toad and wildlife in general, provide a reliable source of funding available for the purchase of preserve lands and/or for support of other conservation initiatives, provide realistic and immediate solutions to business needs, and continue to provide timely and affordable services to local residents.

If issued, Aqua actions authorized under this permit would include the construction and/or installation of below-ground water lines and fixed-foundation facilities (tanks, wells, and a filter plant) on up to 182.2 acres (73.7 hectares) of which approximately 47 percent (86.1 acres [34.8 hectares]) would likely occur within existing ROWs. In addition, Aqua would conduct routine repair, emergency repair, and maintenance of water lines and fixed-foundation facilities, and routine placement of water meters for customer service. Aqua would not exceed 182.2 acres of new installations within the proposed permit area during the life of the permit, and would not exceed 1,200 new meter installations during any year of the life of the permit. The total activity area for Aqua facilities and activities would not exceed 779.6 acres (315.5 hectares) (existing facilities occupy 597.4 acres [241.8 hectares], future new facilities would occupy up to 182.2 acres). Aqua anticipates conducting below-ground repairs and meter sets over approximately 98.4 acres (39.8 hectares) of existing facilities during the life of the permit. A summary of existing and anticipated Aqua facilities and activities by acreage is provided in Table 1.

If issued, LCRA actions authorized under this permit would include the construction and/or installation of new linear facilities (transmission lines, water and wastewater lines, non-impervious roadways, fence lines, and trails) and fixed-foundation facilities (substations, lift stations, telecommunications sites, park pavilions, cabins, parking areas, impervious roadways, and restrooms) on up to 182.1 acres. In addition, LCRA would conduct routine repair, emergency repair, and maintenance of linear and fixed-foundation facilities, and maintenance of some ROWs. LCRA would not exceed 182.1 acres of new installations during the life of the permit. The total activity area for LCRA facilities and activities would not exceed 1,385.7 acres (560.8 hectares) (existing facilities occupy 1,203.6 acres [487.1 hectares], future new facilities would occupy up to 182.1 acres). LCRA anticipates conducting below-ground repairs over approximately 1.5 acres (0.6 hectares) of existing facilities during the life of the permit. A summary of existing and anticipated LCRA facilities and activities by acreage is provided in Table 2.

If issued, BEC actions authorized under this permit would include the construction and/or installation of above-ground distribution lines and fixed-foundation substations on up to 2,186.1

acres (884.7 hectares) of which approximately 87 percent (1,898.4 acres [768.3 hectares]) would be within established ROWs. In addition, BEC would conduct routine repair, emergency repair, and maintenance of above-ground distribution lines and fixed-foundation substations, upgrades to above-ground distribution lines and fixed-foundation substations, and maintenance of some ROWs. Upgrades would include the scheduled replacement of distribution line poles. BEC would not exceed 2,186.1 acres of new installations over the life of the permit. The total activity area for BEC facilities and activities would not exceed 4,397.6 acres (1779.7 hectares) (existing facilities occupy 2,211.5 acres [895.0 hectares], future new facilities would occupy up to 2,186.1 acres). A summary of existing and anticipated BEC facilities and activities by acreage is provided in Table 3.

If issued, AE activities authorized under this permit would include the routine and emergency repair and maintenance of above-ground transmission lines and upgrades to these facilities; upgrades to facilities would include scheduled replacement of transmission line standards. These facilities occupy approximately 229 acres (92.7 hectares). No new installations of AE facilities are anticipated; therefore, the total activity area for AE would be 229 acres). A summary of existing AE facilities and anticipated activities by acreage is provided in Table 4.

Issuance of the permit would authorize incidental take of the Houston toad during activities being conducted by the Utilities as described above and in Tables 1 through 4 throughout the approximately 142,526-acre proposed permit area. Installation of new facilities by the Utilities would be accomplished gradually over the life of the permit. It is expected that over the life of the permit these activities would occur on approximately 6,792 acres (2,749 hectare) (the "activity area"), or roughly 4.8 percent of the proposed permit area (Tables 5 through 7). The majority (about 4,241.2 acres [1717.4 hectares], 62.4 percent of the activity area) of this acreage is attributable to facilities in existence at the time of preparation of the EA/HCP, with the remaining approximately 2,550.4 acres (1,032.1 hectares or 37.6 percent of the activity area) resulting from installation of new facilities (Tables 5 through 7).

Many of the existing facilities (occupying approximately 2,240.8 acres [906.8 hectares]) occur within ROWs (primarily road ROWs) managed and maintained by other entities, and the Utilities estimate that 2,023.5 acres [818.9 hectares] of the anticipated future facilities would be placed within similar ROWs. The remaining 526.9 acres (213.2 hectares) of new facilities would likely be constructed outside of existing roadway ROWs and throughout the proposed permit area; this represents about 7.8 percent of the activity area and about 0.37 percent of the proposed permit area (Tables 5 through 7). This HCP and its related permit do not address activities related to the construction of any roadways, the creation of ROWs associated with such construction, or the maintenance of those roadway ROWs by other entities. However, the permit would cover the maintenance of roadway ROWs by the Utilities.

New facilities authorized by the requested permit would be installed in response to increased demands for such services resulting from increased population within the proposed permit area. The number of new facilities expected to be installed can be estimated based on historical data

Table 1. **Area (acres) within the proposed permit area that would contain Aqua Water Supply Corporation (Aqua) facilities and activities covered under the requested permit.** An "existing right-of-way (ROW)" is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are assumed to occur outside of existing ROWs. Numbers in parentheses are not included in totals, as these activities would be conducted within areas containing existing facilities.

Facilities	Area	Comments
Existing facilities	**597.4**	
below-ground water lines within an existing ROW	298.1	• approximately 1,731,000 linear-feet within 15-foot ROW • Aqua does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	298.1	• approximately 1,731,000 linear-feet within 15-foot ROW • Aqua does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation HT Tank Site	0.2	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: regular visual inspections; general repair and maintenance as needed, typically infrequent and accomplished with light equipment and minimal ground disturbance; vegetation management 1 to 3 times per year and only within and adjacent to footprint
fixed-foundation McDade Tank and Well Site	0.2	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation Lottman Tank Site	0.2	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation Highway 21 Pump Station	0.1	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation 1441 Pump Station	0.1	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation Pump Station M sited	0.2	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation Pinehills Standpipe	0.1	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
fixed-foundation Booth Standpipe	0.1	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: as with HT Tank Site above
Future facilities	**182.2**	
below-ground water lines within existing ROWs	86.1	• approximately 125,000 linear-feet within a 30-foot construction ROW and a 15-foot permanent ROW (construction ROW was used to calculate area) • based on existing conditions, it is assumed that 50 percent of future below-ground lines would be placed within existing roadway ROWs • Aqua does not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	86.1	• approximately 125,000 linear-feet within a 30-foot construction ROW and a 15-foot permanent ROW (construction ROW was used to calculate area) • based on existing conditions, it is assumed that 50 percent of future below-ground lines would be placed within existing roadway ROW • Aqua does not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation wells and tanks	5.0	• this represents the maximum combined footprint and managed grounds for multiple facilities; the actual area may be less • maintenance: as with HT Tank Site above
fixed-foundation filter plant	5.0	• this represents the maximum footprint and managed grounds; the actual area may be less • maintenance: as with HT Tank Site above
install meters at below-ground water lines	(82.6)	• assumptions: based in part on (1) review of meter installations for 1997 through 2000 (501, 581, 693, and 838 meters, respectively; (2) meter installations for the life of the permit would increase yearly and then plateau or decrease; (3) based on the above, assume 1,200 installations per year over the 30-year life of the permit; (4) approximately 100 square-feet of disturbance per installation, or about 2.7552 acres per year for 30 years • this area would be contained within the areas presented above for existing and future below-ground lines • based on review of existing conditions, it is likely that 50 percent of these installations would occur within roadway ROWs
repair below-ground water lines	(15.8)	• assumptions: (1) approximately 200 repairs per 1,713,000 linear-feet of line per year; (2) 1,981,000 linear-feet of line [existing plus anticipated future lines]; (3) based on the above, assume 230 repairs per year over the 30-year life of the permit; (4) approximately 100 square-feet of disturbance per repair, or about 0.528 acres per year for 30 years • this is an over-estimate as the total amount of line would initially be 1,713,000 linear-feet and would not reach 1,981,000 linear-feet until build-out • this area would be contained within the areas presented above for existing and future below-ground lines • based on review of existing conditions, it is likely that 50 percent of these repairs would occur within roadway ROWs
TOTAL AREA	**779.6**	

Table 2. Area (acres) within the proposed permit area that would contain Lower Colorado River Authority (LCRA) facilities and activities covered under the requested permit. An "existing right-of-way (ROW)" is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities, fences, hiking trails, and park-related facilities are assumed to occur outside of existing ROWs. Numbers in parentheses are not included in totals as these activities would be conducted within areas containing existing facilities.

Facilities	Area	Comments
Existing facilities	**1,203.6**	
above-ground transmission lines outside of existing ROWs	1,066.8	• approximately 422,400 linear-feet of line within a 110-foot ROW • typical maintenance activities: ROW prescription once per 67 years; visual inspection once per year; climbing inspection once per 10 years; ROW vegetation management once per 2-4 years; these activities typically cause little soil disturbance • typical repair activities: gate/fence repair once per 26 years; steel/concrete structure repairs once per 10 years; line overhaul once per 10 years; road/creek crossing repair once per 4-6 years; emergency repairs as needed; these activities may cause some soil disturbance
below-ground water lines within existing ROWs	19.8	• approximately 86,400 linear-feet within 10-foot ROWs • LCRA does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
below-ground water lines outside of existing ROWs	2.2	• approximately 9,600 linear-feet within 10-foot ROWs • LCRA does not maintain any ROW associated with these lines. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation Alum Creek Substation	2.8	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance: semi-annual grounds inspection; semi-annual herbicide application; general maintenance as needed; these activities may cause some soil disturbance • repairs typically conducted as detected during inspections, these activities may cause some soil disturbance • no upgrades planned
fixed-foundation Bastrop Substation	2.3	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance, repairs, and upgrades as with Alum Creek Substation above
fixed-foundation Sim Gideon Substation	10.0	• this area is equivalent to the area of the facility plus associated managed grounds • maintenance, repairs, and upgrades as with Alum Creek Substation above
fixed-foundation LCRA equipment at the Bluebonnet Electric Coop. Paige Substation	0.2	• this area is equivalent to the area of the facility, LCRA does not maintain the grounds • general periodic inspection, maintenance, and repairs
fixed-foundation lift stations	0.3	• this is the combined area for three facilities, each with a 0.1-acre footprint area • these list stations are on tracts within subdivisions • maintenance: regular inspections and maintenance as needed for safety and operational concerns; only the portion of the tracts within the vicinity of the facilities are managed; mowing/trimming approximately 5 times per year, including occasional removal of small woody vegetation with hand tools; typically no soil disturbance
boundary/cross fences at the Lake Bastrop Recreational Area	23.3	• approximately 63,360-linear feet within a 16-foot ROW • maintenance: visual inspection, mowing/trimming; repair of trail surfaces; typically little or no soil disturbance
hiking trails at South Shore Park	5.9	• approximately 15,965 linear feet within a 16-foot ROW • approximately 25 percent (15,480 linear-feet) is currently mowed or recently maintained • maintenance: visual inspection, mowing to maintain fire lines; repair of wires and posts; selective herbicide application; typically little or no soil disturbance
fixed-foundation facilities at the 137-acre North Shore Park	15.0	• combined for both parks, this includes 60 recreational vehicle/tent camp sites, 6 screened enclosures, 5 parking lots, 5 septic systems, 4 public restrooms, 2 picnic shelters, 2 boat ramps, 2 entrance stations, 2 maintenance buildings/storage areas, 2 septic lift-stations, 2 recreational vehicle holding-tank dump stations, 1 playground, 1 volleyball court, and 1 park office • maintenance: general activities related to maintaining facilities (painting, pressure washing, etc); mowing/trimming as needed; herbicide application for edging as needed; application of Amdro for fire ant control as needed
fixed foundation facilities at the 131-acre South Shore Park	55.0	
Future facilities	**182.1**	
below-ground utility lines within existing ROWs	39.0	• up to 170,000 linear-feet within a 10-foot ROW • all of these lines would be installed in existing roadway ROWs within or adjacent to planned subdivisions • LCRA would not manage or maintain any of these ROWs after installation. These areas are allowed to re-vegetate back to their prior condition.
fixed-foundation load-serving substations	20.0	• this is the combined area for 2 facilities, each on a 10-acre tract and with an assumed 10-acre footprint • each facility may occupy an area less than the tract size, therefore 20 acres may be an over estimate
fixed-foundation lift stations	0.4	• this is the combined area for 4 facilities, each on a 0.25-acre tract and with an assumed 0.1-acre footprint • these facilities would be installed on tracts within subdivisions
fixed-foundation facilities on 76 acres at South Shore Park	10.0	• combined for both parks these facilities would include 20 cabins, 4 parking lots, 2 septic systems, 2 restrooms, and 1 lodge
fixed-foundation facilities on 46 acres at North Shore Park	6.0	

Table 2. Continued.

Facilities	Area	Comments
upgrade to existing above-ground transmission lines	106.7	• this area is equal to 10 percent of the existing ROW (1,067 acres) and is the approximate area adjacent to the existing ROW that would be needed as temporary construction ROW • potential upgrades include: replacing line; replacing hardware; and potentially replacing support structures
repair below-ground water lines	(1.5)	• assumptions: (1) up to 22 repairs per year [2 repairs per 25,000 linear-feet, assume a total of 266,000 linear feet of existing plus anticipated lines]; (2) 100 square-feet of disturbance per repair, or 0.050512 acres per year for 30 years • this is an over-estimate as the total amount of line would initially be 96,000 linear-feet and would not reach 266,000 linear-feet until build-out • this area would be contained within the areas presented above for existing and future below-ground lines • based on review of existing conditions, it is likely that 90 percent of these repairs would occur within roadway ROW
TOTAL AREA	1,385.7	

Table 3. Area (acres) within the proposed permit area that would contain Bluebonnet Electric Cooperative (BEC) facilities and activities covered under the requested permit. An "existing right-of-way (ROW)" is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are assumed to be occur outside of existing ROW.

Facilities	Area	Comments
Existing facilities	**2,211.5**	
above-ground distribution lines within existing ROWs	1,922.9	• approximately 2,791,623 linear-feet of line within a 30-foot ROW • typical maintenance activities: routine line inspection of about 264,000 linear-feet per year; primary vegetation management of about 264,000 linear-feet per year (may include trimming limbs encroaching on lines, removing smaller vegetation, mowing, spot herbicide treatment, may cause some soil disturbance); secondary vegetation management on about 114,048 linear-feet per year (may include tree trimming, removal of some woody vegetation, herbicide application, use of some heavy equipment, typically with some soil disturbance) • typical repair activities: repairs and emergency repairs as needed; line/pole replacement of about 114,048 linear-feet per year (may include some area outside of the ROW for storage and temporary construction easement, some medium and/or heavy equipment, typically with some soil disturbance)
above-ground distribution lines outside of an existing ROWs	287.3	• approximately 417,139 linear-feet within 30-foot ROWs • typical maintenance activities: routine line inspection of about 264,000 linear-feet per year; primary vegetation management of about 264,000 linear-feet per year (may include trimming limbs encroaching on lines, removing smaller vegetation, mowing, spot herbicide treatment, may cause some soil disturbance); secondary vegetation management on about 114,048 linear-feet per year (may include tree trimming, removal of some woody vegetation, herbicide application, use of some heavy equipment, typically with some soil disturbance) • typical repair activities: repairs and emergency repairs as needed; line/pole replacement of about 114,048 linear-feet per year (may include some area outside of the ROW for storage and temporary construction easement, some medium and/or heavy equipment, typically with some soil disturbance)
fixed-foundation Paige Substation	1.3	• management of vegetation is similar to that described above for linear facilities
Future facilities	**2,186.1**	
above-ground distribution lines within existing ROWs	1,898.4	• up to 2,756,160 linear-feet within a 30-foot ROW • maintenance, repair, and replacement as described above for existing facilities
above-ground distribution lines outside of existing ROWs	283.7	• up to 411,840 linear-feet within a 30-foot ROW • maintenance, repair, and replacement as described above for existing facilities
fixed-foundation substation	4.0	• management of vegetation would be similar to that described above for linear facilities
TOTAL AREA	4,397.6	

Table 4. Area (acres) within the proposed permit area that would contain Austin Energy (AE) facilities and activities covered under the requested permit.

Facilities	Area	Comments
Existing facilities	**228.7**	
above-ground transmission lines	228.7	• approximately 99,600 linear-feet of line within a100-foot ROW • typical light maintenance activities: visual inspection twice per year; minor maintenance with hand tools twice per year or as needed; vegetation management twice per year (may include mowing ground vegetation with a tractor, some tree trimming; typically little or no soil disturbance) • more in-depth maintenance may occur on average once per year, frequently with little soil disturbance
Future facilities	**0.0**	• AE does not anticipate installing any new linear or fixed foundation facilities under the requested permit
TOTAL AREA	**228.7**	

Table 5. Area (acres) occupied by existing facilities and areas anticipated to be occupied by future facilities installed under the requested permit. An "existing right-of-way (ROW)" is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. All fixed-foundation facilities are considered to occur outside of an existing ROW. The percentages of future linear facilities placed in existing ROWs are assumed to be similar to those percentages for existing facilities. See Tables 1-4 for more specific information. Numbers in parentheses are not included in totals as these activities would be conducted within areas containing existing facilities.

Applicant			Area
Aqua Water Supply Corporation			**779.6**
	Existing facilities		597.4
		below-ground linear facilities within an existing ROW (about 50 percent of the total linear facilities)	298.1
		below-ground linear facilities outside of an existing ROW (about 50 percent of the total linear facilities)	298.1
		fixed-foundation facilities	1.2
	Facilities to be installed		182.2
		below-ground linear facilities within an existing ROW (about 50 percent of the total linear facilities)	86.1
		below-ground linear facilities outside of an existing ROW (about 50 percent of the total linear facilities)	86.1
		fixed-foundation facilities	10.0
		install meters at below-ground water line	(82.6)
		repair of below-ground water lines	(15.8)
Lower Colorado River Authority			**1,385.7**
	Existing facilities		1,203.6
		below-ground linear facilities within an existing ROW (about 90 percent of the total below-ground linear facilities)	19.8
		below-ground linear facilities outside of an existing ROW (about 10 percent of the total below-ground linear facilities)	2.2
		above-ground linear facilities outside of an existing ROW	1,066.8
		boundary/fences at the Lake Bastrop Recreation Area	23.3
		hiking trails at South Shore Park	5.9
		fixed-foundation facilities	85.6
	Facilities to be installed		182.1
		below-ground linear facilities within an existing	39.0
		fixed-foundation facilities	36.4
		upgrade to above-ground linear facilities (estimated to be about 10 percent of the total area of upgraded facilities)	106.7
		repair to below-ground water lines	(1.5)
Bluebonnet Electric Cooperative			**4,397.6**
	Existing facilities		2,211.5
		above-ground linear facilities within an existing ROW (about 87 percent of the total linear facilities)	1,922.9
		above-ground linear facilities outside of an existing ROW (about 13 percent of the total linear facilities)	287.3
		fixed-foundation facilities	1.3
	Facilities to be installed		2,186.1
		above-ground linear facilities within an existing ROW (about 87 percent of the total linear facilities)	1,898.4
		above-ground linear facilities outside of an existing ROW (about 13 percent of the total linear facilities)	283.7
		fixed-foundation facilities	4.0
Austin Energy			**228.7**
	Existing facilities		228.7
		above-ground linear facilities	228.7
	Facilities to be installed		0.0
		none	0.0
TOTAL ACTIVITY AREA			**6,791.6**

Table 6. Areas (acres) of existing facilities and anticipated future facilities occurring within and outside of existing rights-of-way (ROWs). An "existing ROW" is defined as a ROW in place prior to the installation of the facility; the most typical example of an existing ROW is a roadway ROW. Areas attributable to Aqua meter sets (82.6 acres), Aqua line repairs (15.8 acres), and LCRA line repairs (1.5 acres) are not included in this table, but would occur within ROWs. See Tables 1-5 for more specific information.

Facility			Area
Facilities within an existing ROW			**4,264.3**
	Existing facilities		2,240.8
		Aqua Water Supply Corp.	298.1
		Lower Colorado River Authority	19.8
		Bluebonnet Electric Cooperative	1,922.9
		Austin Energy	0.0
	Future facilities		2,023.5
		Aqua Water Supply Corp.	86.1
		Lower Colorado River Authority	39.0
		Bluebonnet Electric Cooperative	1,898.4
		Austin Energy	0.0
Facilities outside of an existing ROW			**2,527.3**
	Existing facilities		2,000.4
		Aqua Water Supply Corp.	299.3
		Lower Colorado River Authority	1,183.8
		Bluebonnet Electric Cooperative	288.6
		Austin Energy	228.7
	Future facilities		526.9
		Aqua Water Supply Corp.	96.1
		Lower Colorado River Authority	143.1
		Bluebonnet Electric Cooperative	287.7
		Austin Energy	0.0
TOTAL ACTIVITY AREA			**6,791.6**

Table 7. Areas (acres) of existing and anticipated future facilities as percentages of the proposed permit area and activity area. See Tables 1-6 for more specific information.

Description	Area (acres)	Percentage of Proposed permit area	Percentage of Activity Area
Proposed permit area	142,526	100.0	--
Activity Area	6,791.6	4.8	100.0
Existing facilities	4,241.2	3.0	62.4
within existing ROWs	2,240.8	1.6	33.0
outside of existing ROWs	2,000.4	1.4	29.5
Future facilities	2,550.4	1.8	37.6
within existing ROWs	2,023.5	1.4	29.8
outside of existing ROWs	526.9	0.37	7.8

and anticipated growth (see Section 3.11 of the EA/HCP); however, the exact locations of new facilities that would be installed over the life of the permit cannot be determined at this time because their need is largely market driven. As such, it is not possible to predict in advance what proportion of new facilities would occur within, or adjacent to, Houston toad habitat or other woodlands, subdivisions, agricultural areas, or other disturbed areas. Except within ROWs in existence at the time of issuance of the permit, the Utilities would not initiate new clearing or construction/installation on certain lands without prior discussion with and timely concurrence from the Service. These lands include Bastrop and Buescher state parks, the University of Texas Stengl "Lost Pines Biology Station, and any other lands the Service recognizes as being managed as a preserve for the Houston toad.

Similarly, it is impossible to predict where the need for repairs to existing or future facilities will arise at any given time. For this reason, it is not possible to estimate accurately what final percentage of the activities would occur in areas of Houston toad habitat. This alternative was designed in part to allow the Utilities to proceed with their activities without analyzing the potential for impacts to Houston toads on a case-by-case basis, thereby creating an efficient and effective process by which the Utilities can conduct their business. To accomplish this and provide for conservation of the species, an HCP has been included as part of the proposed action. The HCP (Section 6.0 of the EA/HCP) specifies what steps the Utilities will take to avoid, minimize, and mitigate the potential impacts to the Houston toad to the maximum extent practicable and to avoid and minimize to insignificant the potential for impacts to the bald eagle. Included in this HCP are best management practices (BMPs) that will be implemented while performing all authorized activities to avoid and minimize potential impacts to Houston toads and

bald eagle. In addition, funds would be provided to mitigate for potential impacts associated with the construction of new installations, as well as operation and maintenance of existing facilities.

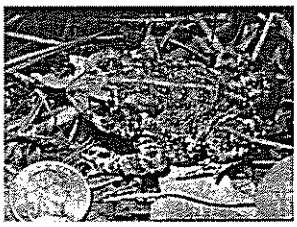
It is possible, although not likely, that projects outside the scope of those described in this section may be required within the proposed permit area by one or more of the Utilities during the life of the requested permit. If this happens, the Utility company will consult with the Service to determine the potential for such unanticipated projects to adversely affect the Houston toad and whether the project(s) could be authorized under the requested permit.

The proposed action is further explained in the Utilities EA/HCP.

4.0 STATUS OF THE SPECIES/CRITICAL HABITAT

In 1970, the Houston toad was listed as endangered (*Federal Register*, October 8, 1970) and in 1978, critical habitat was designated (*Federal Register*, January 31, 1978). The Houston toad is presently viewed as a species with a high degree of imminent threats and a high potential for recovery.

4.1 Species/Critical Habitat Description



Description. The Houston toad is one of six members of the Americanus Group, which includes Woodhouse's toad (*B. woodhouseii*) and whose members range through most of North America (Forstner 2003). They are generally brown and speckled, although individual toad coloration can vary considerably. Some may appear light brown, others almost black, and they may also have a slightly reddish, yellowish, or greyish hue. Two dark bands extend down from each eye to the mouth. Their legs are also banded with darker pigment. A variable white stripe streaks along the sides of the toad's body. The underside is usually pale with small, dark spots. Males have dark throats which appear bluish when distended. Adult Houston toads are two to 3.5 inches (5.1-8.9 centimeters) long and, like all toads, are covered with raised patches of skin that resemble warts. These toads have two parotid glands that contain chemicals that make them distasteful and sometimes poisonous to predators (USFWS 1984). Although Houston toads are similar in appearance to the closely-related Gulf Coast (*B. valliceps*) and Woodhouse's toads, distinguishing characteristics can be discerned, and mitochondrial DNA sequence analysis indicates that the Houston toad is a unique evolutionary unit separate from the other species (Forstner and Dixon 2000).

Habitat. Houston toads are associated with forest ecosystems and sandy soils. Based on 1997 satellite imagery (Service unpubl. data), aerial photographs, U.S. Geological Survey topographic maps, and 1977 land cover maps (Texas Department of Water Resources 1978), all of the known Houston toad populations including a historic locality in Liberty County are associated with tracts of forests dominated by pines, oaks, and other deciduous trees. Houston toad habitat consists of rolling uplands characterized by pine and/or oak woodlands underlain by deep, sandy soils. Tree species vary from one region to the next, but typically include loblolly pine (*Pinus taeda*), post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), and/or sandjack oak (*Q. incana*).

Although the Houston toad does not appear to be tied to the presence of a particular species of tree, pine is dominant in the Lost Pines forest of Bastrop County and occurs in other counties within the Houston toad's range. The Lost Pines is the most extensive stand of loblolly pines outside of the East Texas pine belt about 100 miles (160 kilometers) to the east, geographically separated by intervening prairie and savannah. Forests provide habitat partitioning that reduces competition with other toad species, cover to escape from predators and harsh climatic conditions, shade to prevent heating the sandy soils, and food supplies. Forests also provide habitat continuity needed to maintain dispersal corridors between breeding and terrestrial habitats (Laan and Verboom 1990, Rudolph and Dickson 1990, Welsh 1990, deMaynadier and Hunter 1998, Gibbs 1998, Knutson et al. 1999, Forstner 2003).

Like the loblolly pines, Houston toads are found in areas of sandy soils (no more than 20 percent clay), which form over the Sparta, Queens City, Carrizo, Willis, Weches, Reklaw, and Goliad formations (Yantis 1991, Forstner 2003). The Calvert Bluff Formation, which is a mudstone with varying amounts of sandstone, lignite, and ironstone, has not been known to be associated with Houston toad breeding locations. However, breeding ponds have been found on the Calvert Bluff in close proximity to the Carrizo Sand (Forstner 2003). These soils effectively catch rainfall, and little is lost to runoff (Soil Conservation Service 1979). Because the Houston toad is an ectotherm and its skin is highly vulnerable to desiccation, it becomes dormant during harsh weather conditions, such as winter cold (hibernation) and summer heat and drought (aestivation), and seek protection by burrowing into moist sand or hiding under rocks, leaf litter, logs, or in abandoned animal burrows (TPWD 1993, Forstner, pers. comm. 2004).

The presence of water is one of the most important limiting factors for the Houston toad. Breeding occurs in shallow, rain-fed puddles and pools that persist long enough for the eggs laid to hatch into tadpoles and metamorphose into toadlets (Hillis et al. 1984, Price 1992). Houston toads have also been documented as breeding in permanent ponds and stock tanks within suitable habitat, although stock tanks and ponds with heavily impacted margins are not used by the toads (Forstner 2001). Rainfall may stimulate breeding (Kennedy 1962, Price 1992), migration (Quinn et al. 1984) and feeding activities; prevents desiccation; and provides pools of water for reproduction.

Although it ostensibly has the required habitat characteristics of woodlands and deep sandy soils, repeated search efforts by several biologists have been unsuccessful in locating Houston toads on the Camp Swift Military Reservation, located west of Highway 95 in Bastrop County (Martin et al. 1979, Dixon 1982, Espey, Huston and Associates, Inc. 1995, Forstner 2002b). The lack of Houston toads may be due to the greater clay content of the soil and lack of seeps and springs, although it is also possible that past military uses extirpated the toads (Forstner 2003).

Critical Habitat. Critical habitat includes areas that are essential to the conservation of a threatened or endangered species and that may require special management considerations or protection. Although not described when the critical habitat was designated, essential habitat requirements for the toad include seasonally-flooded breeding ponds, deep sandy soils, and forest or woodlands. The Service designated critical habitat in Bastrop County, covering about 98,000 acres in the central portion of the county, and in Burleson County, covering about 2,000 acres

surrounding Lake Woodrow, where toads were known to occur at the time (Figure 2). Little was known about the habitat requirements of the Houston toad at the time of designation. Since that time, more occupied Houston toad habitat has been documented in seven additional counties, and the area designated as critical habitat in Burleson County is no longer occupied. Good Houston toad habitat has been found north of the critical habitat delineation in Bastrop County and into Lee County.

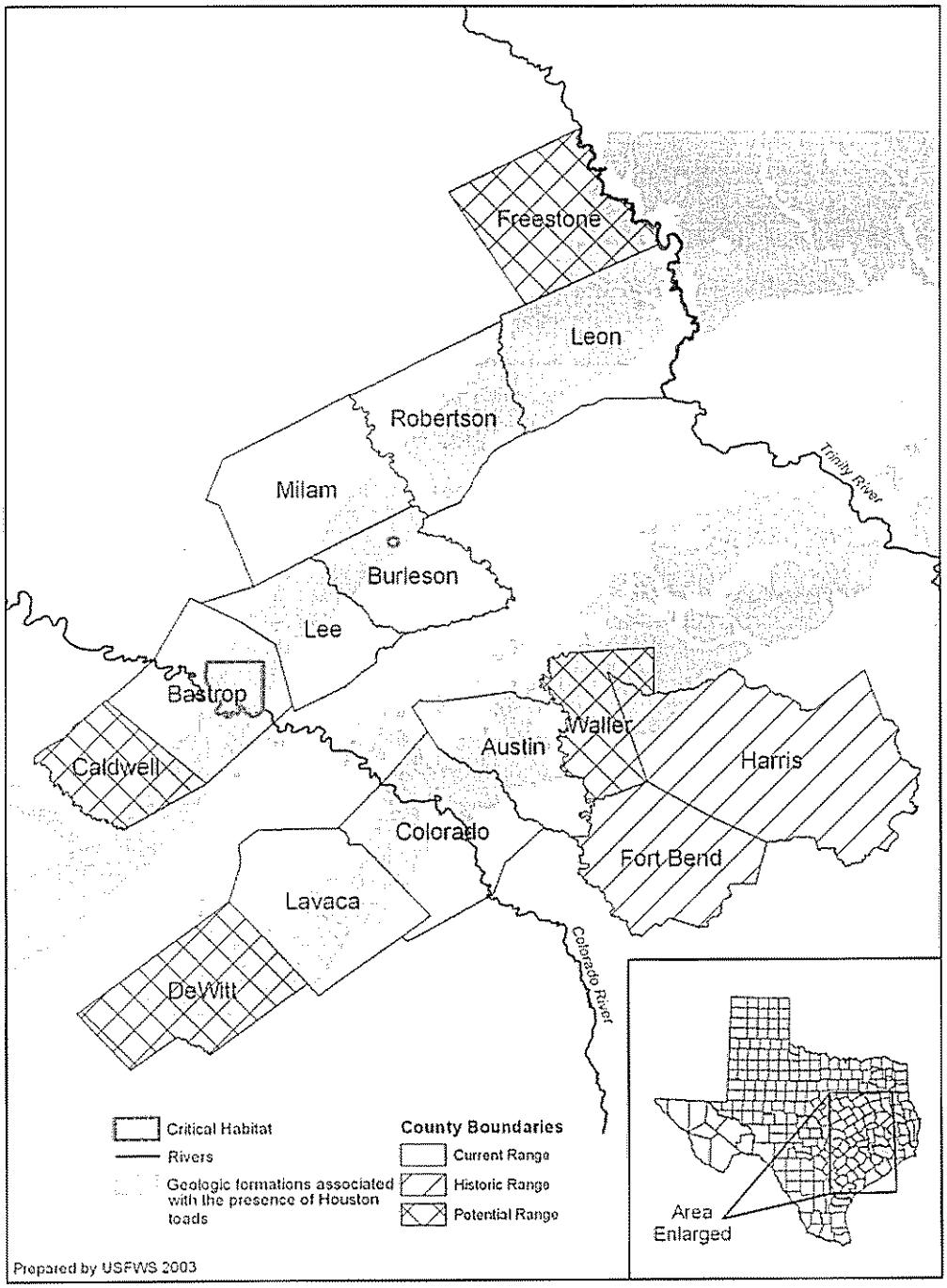
4.2 Life History

Reproduction. The life expectancy of the Houston toad is at least three years and perhaps longer (Price 1992). Males reach sexual maturity at about one year, but females require one to two years to achieve reproductive maturity (Quinn 1981). In mark-recapture surveys of Houston toads in Bastrop, observed sex ratios of males to females have been highly skewed in favor of males, ranging from 3:1 to 10:1 (Dixon et al. 1990; Forstner 2002a, 2002b, 2003). The Houston toad is an "explosive" breeder, appearing in large numbers at breeding ponds where the males call to attract females over a period of a few nights throughout the breeding season, beginning as early as January 18 (Dixon 1982). Houston toads breed from late January to June (Kennedy 1962, Hillis et al. 1984, Forstner 2003), with a peak in February and March. Large numbers of males congregate at a single location while only small numbers of individuals may appear at nearby ponds. The greater the number of chorusing males, the more likely for females to arrive at the pond. Many locations found in a recent Bastrop County study failed to reach numbers likely to attract females (Forstner 2002b). Chorusing from individual ponds lasts from three to five days, but may not be synchronized with other ponds in the area. Two or three primary breeding periods separated by two to six week intervals occur at suitable ponds, and males may mate during more than one breeding episode (Hillis et al. 1984). Reported egg-laying dates in the field range from February 18 to June 26 (Kennedy 1961, Dixon 1982, Hillis et al. 1984). In Bastrop County, the earliest chorusing was January 22 and the earliest egg laying was February 18. May 2 was the latest date a gravid female was observed (Hillis et al. 1984, Forstner 2002a).

Under suitable environmental conditions, Hillis et al. (1984) observed males calling just before sunset from burrows or thick layers of pine needles along gulleys leading to the ponds and beginning to travel to the ponds. The burrows ranged from three feet (one meter) to more than 130 feet (40 meters) from the shore. After breeding, the burrows appeared to be abandoned. Females arrive later in the evening. Pairs remain in amplexus for six hours at minimum and eggs are laid in the early morning hours among vegetation or debris near the bank. Reported clutch sizes per female vary from 512 to 6,199 eggs (Kennedy 1961, Quinn and Mengden 1984, Quinn et al. 1987).

This species typically uses ephemeral rain pools for breeding, although it has been known to breed in flooded fields and permanent ponds. Presently, the most reliable breeding sites are stock ponds and similar impoundments, although in wet years breeding may occur wherever sufficient standing water is present. Unfortunately, permanent water bodies tend to have more predators, such as fish, turtles, bullfrogs (*Rana catesbeiana*), aquatic invertebrates, and snakes (Forstner 2001). For

Figure 2. Texas counties with current, historic, or potential Houston toad range, including critical habitat



successful breeding, water must persist for at least 60 days to allow for egg hatching, tadpole maturation, and emergence of toadlets (Hillis et al.1984, Price 1992).

During the breeding season, adult Houston toads travel between different sites within and between years. A marked adult male traveled a minimum of 4,469 feet (1,375 meters) each way between two ponds in a two-year period. Another marked individual in the same study covered 1,592 feet (490 meters) within a 24-hour period (Price 1992). Price (unpubl. data, 2001) has documented the same individually-marked male and female Houston toads using breeding ponds that are over one mile (1.6 kilometers) apart (straight-line distance) and in different watersheds. Individuals have been observed traveling up to 3,900 feet (300 meters) to breeding ponds through areas that included gravel roads, divided highways, and pastures (Dixon et al. 1990, Price 1990a, Yantis 1994).

Development rates vary depending on temperature and other factors. Eggs may hatch within seven days, and tadpoles may remain in the pond for 40 to 80 days depending on environmental conditions. Metamorphosis of tadpoles in a given pond generally occurs at the same time over a period of a few hours, resulting in postmetamorphic aggregations of toadlets that remain at the edge of the pond for seven to ten days or more (Hillis et al. 1984, Dixon et al. 1990, Forstner 2002a). Hillis et al. (1984) observed large numbers of toadlets moving as far as 330 feet (100 meters) in daylight from their natal ponds along the same gulleys used by adult toads during the breeding season. Mortality in young is extremely high due to predation and drying of breeding sites, and less than one percent of eggs laid are believed to survive to adulthood (Quinn 1981, Price 1992, Forstner 2002a, 2002b, 2003). On the Griffith League Ranch in northern Bastrop County, Forstner noted that only three out of eleven ponds that had had successful breeding also had successful emergence of toadlets. Therefore, successful chorusing may not mean successful breeding.

Dispersal. Many amphibians occupy upland sites at substantial distances from the nearest breeding pond, and members of the *Bufo* genus are among the most terrestrial anurans. They live on land following metamorphosis and return to water only briefly during the breeding season (Christein and Taylor 1978). Houston toads may range widely throughout upland habitats (Price 1992, 1990a; Dixon et al. 1990; Yantis 1994). Breeding is often followed by aestivation, but toads are known to emerge and be active at other times (Dodd and Cade 1998, Dixon et al. 1990, Dronen 1991, Forstner 2002a). Although Houston toads are known to be active during the nonbreeding season, because of the toad's secretive nature, little is known about its distribution and activities during this period. Toads, especially first year toadlets and juveniles, are active year-round if conditions are favorable for foraging. If conditions are not favorable in a given year, toads may not emerge at all (TPWD 1993). Dronen (1991) reported frequent captures of small Houston toads about 1.5 inches (3.8 centimeters) in body length in pitfall traps during the fall (September through early November) and late winter (late January and early February). Toads were generally captured when temperatures were mild (59 to 77°F (15 to 25°C) and following periods of rainfall. Forstner collected adults as early as December and as late as August on Griffith League Ranch. Although juveniles were collected in the summer, adults rarely were. All Houston toads collected by Forstner, adults and juveniles, were collected in or within 162 feet (50 meters) of forest habitat despite placing arrays throughout the pasture areas. In contrast to

breeding season movements, where adult Houston toads may travel over a mile across inhospitable areas such as roads, gravel soils and pastures (Dixon et al. 1990, Price 1990a, Yantis 1994), Forstner concluded that outside of the breeding season they do not inhabit or cross pastures beyond 50 meters (162 feet) of the forest, and adults range a maximum of less than a mile from the ponds in which they call. Juveniles and subadults may travel farther (Forstner 2000, 2001, 2002a).

Food Habits. Algae and pollen found in permanent or ephemeral water bodies comprise important sources of food for tadpoles (Hillis et. al. 1984). Adult toads are indiscriminate feeders and eat a wide variety of insects and small vertebrates (Robert Thomas, Loyola University, unpubl. data in Service 1984; Bragg 1960).

4.3 Threats

Small, sedentary species with restricted distributions, specialized habitat niches, and narrow climatic tolerances are particularly vulnerable to extinction (Welsh 1990, deMaynadier and Hunter 1998). The distribution of the Houston toad appears to be restricted naturally as the result of specific habitat requirements for breeding and development. These natural restrictions make them particularly vulnerable to the negative effects of human-induced changes that result in habitat loss, degradation, and fragmentation. Threats include expanding urbanization, conversion of woodlands to agriculture, logging, mineral production, alteration of watershed drainages, wetland degradation or destruction, and other processes that contribute to loss of suitable breeding, feeding, or sheltering habitat.

Habitat Destruction and Landscape Fragmentation. Habitat conversion and fragmentation make the Houston toad more vulnerable to predation, competition, and hybridization. Removal of trees acts to exacerbate the effect of drought on a local scale by increasing heat at ground level and consequent moisture loss from the soil, which makes the deforested area unsuitable for Houston toads that need to burrow to escape desiccation (Forstner 2003). Excavation and impoundment of seasonal or ephemeral drainages creates permanent open water as opposed to ephemeral ponds and pools. Permanent water is more likely to harbor predators such as birds, mammals, snakes, turtles, fish, aquatic invertebrates, and bullfrogs (Quinn and Ferguson 1983, Dixon et al. 1990) and potential competitors such as Woodhouse's and Gulf Coast toads (Hillis et al. 1984).

Habitat disturbance also encourages the establishment and proliferation of red-imported fire ants *(Solenopsis invicta).* Fire ants are known to prey on newly-metamorphosed toadlets (Freed and Neitman 1988, Dixon et al. 1990, Forstner 2002a), as well as on the invertebrate community that is an important part of the toad's food base (TPWD 1993). Fire ants are associated with open habitats disturbed as a result of human activity (such as old fields, lawns, roadsides, ponds, and other open, sunny habitats), but are absent or rare in late succession or climax communities such as mature forest (Tschinkel 1988). Thus, maintaining large, undisturbed areas of woodlands may help control the spread of fire ants (Porter et al. 1991) and protect native ant populations (Porter et al. 1988, 1991; Suarez et al. 1998). The presence of fire ants has however been documented around all ponds on Griffith League Ranch, the majority of which are located within undisturbed woodlands (Forstner, pers. comm. 2003).

Paved roads, even roads less than ten feet (three meters) wide, can prevent or hinder dispersal and effectively isolate populations of some invertebrates, small mammals (Mader 1984, Mader et al. 1990), and amphibians (Van Gelder 1973, Reh and Seitz 1990, Soulé et al. 1992, Fahrig et al. 1995, Yanes et al. 1995, Findlay and Houlahan 1997, Gibbs 1998, Vos and Chardon 1998, Knutson et al. 1999). Highways can have serious demographic consequences by increasing mortality and reducing connectivity and migration among remnant habitat patches. Surveys along a five-mile stretch of Highway 21 adjacent to breeding ponds near Bastrop State Park during 1990 reported 67 percent mortality of Houston toads (12 of 18 individuals) observed in the right-of-way during the breeding season (Dixon 1990, Price 1990c).

Agricultural production may contribute to habitat loss by converting forests to pasture or cropland; draining, filling, or deepening of wetlands; and compacting the soil. Plowing, mowing, applying herbicides, pesticides and fertilizers, and disturbing aestivating toads can result in direct toad mortalities (Knutson et al. 1999, Little et al. 2002). Habitat conversion to cropland or pasture also encourages the establishment of fire ants. Livestock and hay production are common land uses throughout much of the Houston toad's range (Yantis 1989, 1991). Dense sod-forming grasses, such as Bermuda grass (*Cynodon dactylon*), can inhibit the Houston toad's mobility (Yantis 1989). Livestock grazing is a common use of woodlands in the range of the Houston toad. Livestock can trample egg clutches, larvae, and toadlets in breeding pools, and juveniles and adult toads may be crushed by livestock. Forstner reported a dramatic return of wetland vegetation with the removal of cattle from Griffith League Ranch and an increase in breeding success (Forstner 2001).

North American literature on relationships between common forest harvesting practices and the distribution and abundance of amphibians has been summarized by deMaynadier and Hunter (1995). They found negative short-term impacts from clearcuts, variable long-term effects from other types of forest harvesting, and significant long-term effects in forest plantations.

Knutson et al. (1999) found a consistent negative association between the presence of urban land and effects across many anuran guilds. Inhospitable habitats are created through the building of roads, homesites, and commercial/industrial areas, removal of natural forest, planting of exotic turf grasses, draining or degradation of breeding ponds, and application of pesticides. Urban areas provide opportunities for increased exposure to fire ants, other predators, and competitors. These factors may work synergistically with other detrimental effects of habitat fragmentation to decrease the numbers and distribution of toad populations. The loss of Houston toads from the Houston area demonstrates the toad's vulnerability to urbanization. With the establishment of the new Bergstrom International Airport and the expansion of the Austin-San Marcos metropolitan area, suburban development is expanding in the Lost Pines Houston toad habitat in Bastrop County.

Competition and Hybridization. Competitors of the Houston toad include Woodhouse's and the Gulf Coast toad. Hybridization with these species, which could eventually result in the loss of the Houston toad as a distinct species, has been documented. All three species are found in areas of deep, sandy soils. The Gulf Coast toad breeds later than the Houston toad, and while their breeding seasons are similar, the Woodhouse toad is found more often in open areas. Most

hybrids have been found where the habitat of the Houston toad has been altered from woodlands to pasture or suburban development, allowing the invasion of the other species (Hillis et al. 1984; Yantis 1991; Forstner 2002a, 2003).

Drought. Drought conditions can have a severe effect on the Houston toad as breeding ponds fail to fill or dry up before eggs or tadpoles can metamorphose. The low numbers of chorusing males recorded recently compared to the numbers encountered in 1989-1990 may be the result of the mid-1990s drought (Price 1989-1990 unpubl. data, Forstner 2000). In combination with other threats such as land use changes and urbanization, droughts may reduce small populations to such low numbers that they are unable to recover (Soule et al. 1992; Pechmann and Wilbur 1994; Forstner 2003).

Wildfire. Frequent and/or severe forest fires may be detrimental to the Houston toad, particularly for small, fragmented populations. On the other hand, periodic controlled burns may be necessary to reduce fuel loads, prevent catastrophic fires, and improve habitat conditions beneath the forest canopy (Yantis 1989, Price 1993). Although necessary to determine the short and long-range effects of various fire regimes, little research has addressed the effects of fire on amphibians (deMaynadier and Hunter 1995).

Pesticide, Fertilizer, and Contaminant Impacts. Amphibians, particularly their eggs and larvae, are sensitive to many pollutants, such as heavy metals, certain insecticides (particularly cyclodienes, such as endosulfan, endrin, toxaphene, and dieldrin), nitrites, salts, certain organophosphates (such as parathion and malathion), and petroleum hydrocarbons (Harfenist et al. 1989, Little et al. 2002, SAIC 2003). Because of their semipermeable skin, the development of their eggs and larvae in water, and their position in the food web, amphibians are vulnerable to waterborne and airborne pollutants. Pesticides can also change the quality and quantity of amphibian food and habitat (Bishop and Pettit 1992).

Mineral Production Impacts. Oil and gas fields occur throughout much of the Houston toad's range. The installation of oil and gas wells, roadways, staging areas, and well drilling activities can result in toad mortality, habitat loss, and fragmentation. Trenching or construction in areas inhabited by aestivating toads, and trapping toads in open trenches or pits can result in toad mortality, and reproduction can be disrupted by destroying breeding sites. In addition to oil and gas production, mining operations (including lignite, gravel, and sand) can also result in severe, if not total, habitat loss in areas occupied by the Houston toad. Direct mortality of Houston toads and destruction of their habitat may occur in the mine area. In addition, Dixon (1982) identified possible indirect impacts from lignite mining: dewatering may draw down surface waters and dry out the subsurface moisture which may reduce the carrying capacity of permanent surface ponds and/or ephemeral pools, and leaching of sulphur and weak carbonic acids from the mine may produce poor water quality downstream in areas used by the toad.

4.4 Population Dynamics

No reliable estimate of the total Houston toad population size is yet available. Population estimates for the Houston toad are difficult to develop because of the non-random nature of

historical surveys, lack of access to private lands to conduct surveys, lack of acceptable methods to extrapolate breeding counts to the population as a whole, and the difficulty in locating the toad in times other than the breeding season (Forstner 2003).

The Lost Pines forest in Bastrop County supports the largest known population of Houston toads throughout their limited range. The size of the populations in counties other than Bastrop is poorly known and warrants further investigation. Yantis (1991) estimated that the density of male Houston toads in their range outside of Bastrop County to be one toad per 251 acres, or a total of 2,000 to 5,000 adult male toads. Additional significant breeding events have recently been identified near the Lee and Bastrop county line (Kuhl 1997, Forstner and Dixon 2000). Seal (1994) estimated 2,000 Houston toads within Bastrop County in 1994. In 2001, TPWD estimated the population of Houston toads in Bastrop County as at least 2,000 adults (TPWD 2001) and surveys conducted in 2002 along roadways in portions of Bastrop County resulted in an estimate of approximately 1,200 male Houston toads under "the most liberal evaluation" of the survey data (Forstner 2002b). Additionally, the 2002 survey found a high concentration of Houston toads within low density subdivisions that occur in areas likely to be high quality Houston toad habitat, but it is unknown to what extent the aggregations of calling males heard there resulted in successful breeding and emergence of toadlets. Forstner (2003) reported making an assumption-laden conclusion and drawing a liberal estimate using data from Griffith League Ranch and Bastrop State Park that Houston toad densities may not exceed 1 adult toad per 25 acres of habitat in Bastrop County. Only 70 Houston toads were found at ponds and 95 toads trapped in herptofaunal arrays during 2002 surveys on the 4,848-acre (1,962 hectare) Griffith League Ranch, which supports good habitat (Forstner 2002a). Past estimates of population size in Bastrop County have ranged from 300 to 2,000 (Brown 1975, Seal 1994) based on data collected primarily at Bastrop State Park.

Recent trend analyses indicate that Houston toad numbers in Bastrop State Park are declining (Service 1999, Price, unpubl. data 2004). Reasons for the decline are not known, but are likely related to development activities and drought conditions in the 1990s (Forstner 2002a, Andy Price, TPWD, pers. comm. 2004). Price feels that the population has stabilized at a lower level than that of a decade ago. He believes the area experienced a severe drought in the 1990's which may have caused the decline. Surveys conducted by Forstner along roadways in portions of Bastrop County resulted in an estimate of approximately 1,200 males although the overall chorus sizes were "quite small" as compared to historical reports (Forstner 2002b). Nevertheless, given the high reproductive potential of females, if the threats to the survival of eggs, tadpoles, and toadlets can be identified and ameliorated, the Houston toad population could rebound very quickly.

Based on the studies conducted by TPWD at Bastrop State Park and other studies by Forstner, the Houston toad population within the proposed permit area may consist of a few to several thousand adult toads. In mark-recapture surveys of Houston toads in Bastrop County, observed sex ratios of males to females have been highly skewed in favor of males, ranging from 3:1 to 10:1 (Dixon et al. 1990, Forstner 2002a, 2002b, Andy Price, TPWD, pers. comm. 2004).

The Houston toad's population structure appears to fit the definition of a metapopulation (Soulé 1987, Marsh and Trenham 2001) because it consists of subpopulations in somewhat geographically isolated patches, interconnected through patterns of gene flow, extinction, and recolonization (Soulé 1987, Marsh and Trenham 2001). In some areas, what were once subpopulations of larger metapopulations are now apparently isolated from each other by urbanization, heavily used roads, and agriculture. Some of these changes may be reversible, allowing currently isolated populations to become part of greater metapopulations. In other cases, the changes have been so extensive that reconnection may no longer be an option. Other populations appear to be naturally isolated by riverine basins and geologic formations and may be part of separate metapopulations.

4.5 Range

Houston toad populations occur only in Texas and only along two parallel bands of geologic formations (Figure 2). One band runs through Bastrop, Lee, Burleson, Milam, Robertson, Leon, and Freestone counties and includes the Carrizo, Queen City, Reklaw, Sparta, and Weches formations. The other band runs through Austin, Colorado, and Lavaca counties and includes the Willis and Goliad formations. These geologic formations form various sandy soils, including loamy fine sands and fine sandy loams.

Houston toads are currently known to occur in Bastrop, Lee, Burleson, Milam, Robertson, Leon, Lavaca, Colorado, and Austin counties. There are also historical records from Fort Bend, Harris, and Liberty counties, but extensive surveys and documentation of the extent of habitat loss and degradation have confirmed the Houston toad's extirpation from these three counties (Hillis et al. 1984, Yantis 1989, 1990, 1991, 1992a). The only known population south of the Colorado River was found at one site in Lavaca County in 1991, but no Houston toads were heard on subsequent visits. Habitat in Lavaca County appears to be quite limited (Yantis 1991, 1992a, 1992b, 1994). Houston toads have not been found at the critical habitat site (Woodrow Lake) in Burleson County since 1983 although other populations have been found in the county (Dixon 1983, Yantis 1989, 1990, 1991, 1992a, 1992b). The Houston toad may also exist in Freestone, Dewitt, Waller, and Caldwell counties based on potential habitat, but no populations have been confirmed (Yantis 1989, 1990, 1991, 1992a and pers. comm., 1995).

The Lost Pines region of Bastrop and Lee counties continues to support the largest known, and best studied, population of Houston toads (Sanders 1953; Brown 1971; Yantis 1989, 1990, 1991, 1992a; Dixon 1982; Price 1990a, 1990b, 1990c, 1992, 1993; Forstner 2000, 2002, 2002a, 2002b, 2003). Houston toad populations have been documented both within the federally designated critical habitat in Bastrop County, including the north and south shores of Lake Bastrop and low-density suburban developments, and in Lee County (Forstner 2000, 2001, 2002a, 2002b, 2003).

The Houston toad population in Bastrop County is likely part of a larger biologically relevant population in the area bounded by the Colorado River on the south, extending well into Lee County on the north (Forstner 2003).

4.6 Analysis of the species/critical habitat likely to be affected

The five federally listed species identified within the Utilities draft EA/HCP include the endangered Houston toad (and its designated critical habitat), endangered interior least tern, endangered whooping crane, threatened bald eagle, and threatened piping plover. The Houston toad is the only federally listed species that is likely to be impacted by the proposed action, and therefore is the only species to be included on the proposed permit. The proposed action is also located within designated critical habitat for the Houston toad. The interior least tern, whooping crane, and piping plover are likely to occur within the proposed permit boundary only briefly during their annual migration and any impacts to these species are unlikely. The bald eagle, proposed for delisting on July 4, 1999, is a regular migrant and winter resident in the eastern half of Texas and is usually associated with large bodies of water. In Bastrop and Lee counties bald eagles are a rare occurrence. When identified, they generally are feeding or nesting along the Colorado River. The Utilities have included specific steps that will avoid and minimize to insignificant the potential for impacts to the bald eagle. Because of this, the Utilities believe take coverage for the bald eagle is not necessary. Since take coverage is not being requested, and the likelihood of impacts are so insignificant, the interior least tern, whooping crane, piping plover, and bald eagle are not considered further in this consultation.

Another federally listed species, the endangered Navasota ladies'-tresses may also occur within the proposed permit area. Based solely on morphological identification, this species was recently discovered in Bastrop and Lee counties. The Service was notified of the Bastrop County population in September 2004. This population is located on property owned by the University of Texas (Stengl "Lost Pines" Biology Station). The Lee County population was identified in October 2004 along a county road near the Bastrop/Lee County line. After further examination by Service botanists, it appears the Lee County population is likely Nodding ladies'-tresses. Further genetic work is underway, and will confirm their true identification. This confirmation will likely occur after issuance of this permit.

The draft EA/HCP that was provided to the public did not consider possible impacts to this species since its discovery was well after the draft EA/HCP was written and the public comment period had closed. To ensure the Utilities proposed actions do not jeopardize the continued existence of this species and, are adequately addressed under NEPA, the final EA/HCP will be amended to evaluate possible impacts as a result of the proposed activities. However, this species will not be listed on the section 10(a) permit because the take prohibition for federally listed plants under the Act is more limited than for listed animals. Section 9(a)(2)(B) prohibits the removal of listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of listed plants on non-Federal areas in violation of state law or regulation. Thus, the Act does not prohibit the incidental take of federally listed plants on private lands unless the take or the action resulting in the take is in violation of state law. This, generally, eliminates the need for an incidental take permit for plants. Since neither of these will occur, inclusion of this species is not necessary.

The section 7(a)(2) prohibition against jeopardy applies to plants as well as wildlife species and as such are addressed in this Biological Opinion. A supplement to the EA/HCP will also be included

to address possible impacts to this species. This supplement will include additional BMP's that help minimize or avoid impacts. As identified in the HCP, areas frequently associated with this species such as drainage features and other wetlands will be avoided. The HCP also requires Service concurrence before any clearing or construction activities occur on lands the Service recognizes as being managed as a preserve for the Houston toad which includes the University of Texas, Stengl "Lost Pines" Biology Station, the only known Navasota ladies'-tresses location in Bastrop County. Additionally, this population was not contemplated in the Recovery Plan and as such is not essential to recovery. Critical habitat for this species will not be impacted since none was designated. Since the Service has determined that significant impacts to this species are unlikely, will not result in jeopardy, and since the species will not be included on the permit, it will not be considered further in this consultation.

5.0 ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the effects of the action on federally listed species, the Service is required to take into consideration the environmental baseline. Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions, and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects that have undergone section 7 consultation and the impacts of State and private actions that are contemporaneous with the consultation in progress. The environmental baseline refers to the current status, distribution, threats, and trends of the species and its habitat in the action area to define a platform to assess the effects of the action now under consultation. The Service considers the action area to be the 142,526-acre permit area.

The proposed permit area contains the largest known blocks of Houston toad habitat remaining in Bastrop and Lee Counties. This area is known to harbor the Houston toad during all times of the year for breeding, feeding, sheltering, and/or dispersal. The proposed permit area is located both inside and outside of federally designated critical habitat for the Houston toad (Figure 1).

Because of the level of habitat fragmentation within the Bastrop/Lee county region, this area encompasses two artificially separate populations of Houston toads: (1) north of Highway 290 into Lee County and (2) south of Highway 290 to the Colorado River. These two areas constitute about 126,000 acres (50,992 hectares) that the Houston toad may inhabit in Bastrop County. Within this area, about 48 percent of Houston toad habitat has been platted for single family housing and/or degraded in some way (converted for agricultural uses, timber harvest, commercial development, roadways).

The Bastrop County pine/oak woodlands north of Highway 290 comprise approximately 27,300 acres (11,048 hectares), of which approximately 55 percent has been cleared, platted, and/or partially developed. Most of the habitat fragmentation within this area is due to agricultural clearing practices. The same sandy soils, woodlands and underlying geology extend northeast through Lee County. However, the Lee County woodlands are much more fragmented, and the status of the Houston toad population is unknown although, significant breeding events have

recently been identified near the Lee and Bastrop county lines (Kuhl 1997, Forstner and Dixon 2000). Approximately 35,573 acres of the proposed permit area are located within Lee County.

The pine/oak woodland between the Colorado River and Highway 290, the Lost Pines, supports about 98,700 acres (39,943 hectares) of woodland, of which about 44 percent has currently been cleared, platted, and/or partially developed. Within the Lost Pines, the existing subdivisions and roads have further fragmented the toad's habitat into approximately four remaining habitat blocks: (1) south of Highway 71, (2) north of Highway 21, (3) in, and around, Bastrop State Park, and (4) in, and around, the University of Texas Biology Station and Buescher State Park.

(1) South of Highway 71, development activity, coupled with impacts from Highway 71 and distance from other populations, has fragmented the habitat to the extent that the ability of toads to persist in this area over the long-term is uncertain. The largest remaining habitat block south of Highway 71 is less than 1,700 acres (688 hectares).

(2) North of Highway 21, a block of about 8,700 acres (3,521 hectares) remains undeveloped, including the 4,848-acre Griffith League Ranch and the adjacent 400-acre (161.9-hectare) preserve and research station that was recently purchased by Bastrop County. Low density subdivisions adjacent to Griffith League Ranch also support Houston toads (Forstner 2002b).

(3) In, and around, the 5,926-acre (2,398-hectare) Bastrop State Park, about 16,250 acres (6,576 hectares) in this area remain undeveloped. Recently, selective logging on private lands within this area has occurred.

(4) About 10,450 acres (4,229 hectares) remain undeveloped in, and around, University of Texas Biology Station and Buescher State Park. However, approximately 1,500 acres (607 hectares) in this area were partially cleared in 1997 for agricultural purposes. The University of Texas Biology Station and Buescher State Park total about 1,750 acres (708 hectares).

Residential development and logging are occurring in critical habitat, further reducing the available habitat for the Houston toad. As of June 03, 2004, the date of the final draft EA/HCP, the Service had issued 232 section 10(a)(1)(B) permits for incidental take of Houston toads within the proposed permit area. Most (181) of these permits were issued under the "46-subdivision" HCP – participation in this plan is available to residents of 46 subdivisions platted before 2000 in Bastrop County. The total area for all section 10(a)(1)(B) permits issued within the proposed permit area is approximately 5,985 acres (2,422 hectares), 376 acres (152.2 hectares) of which are attributable to the "46-subdivision" HCP. The total acreage also includes the permit for incidental take of Houston toads during the development and operation of the approximately 4,848-acre high adventure Boy Scout camp in Bastrop County (Griffith League Ranch). These acreage totals reflect the total area of properties and not an estimate of "take" in terms of habitat.

The proposed measures for avoiding, minimizing, and mitigating for potential adverse impacts to Houston toads, as set forth in the proposed HCP, will assist the Utilities in developing long-term

business and budget plans, and will greatly contribute to the recovery and survival of the toad. In addition to the Utilities' proposed BMPs and mitigation measures, other existing and proposed conservation measures are in place or are being formulated within the plan area and include:

- The 46-subdivision HCP covering 6,609 acres (2,675 hectares) within the permit area (existing);
- Bastrop State Park covering 5,926 acres within the permit area (existing);
- Buescher State Park covering 1,017 acres (412 hectares) within the permit area (existing);
- Lost Pines HCP covering 124,000 acres (50,182 hectares) within the permit area (proposed);
- Boy Scouts of America EA/HCP for the Griffith League Ranch covering 4,848 acres within the permit area, approximately 2,712 acres (1,098 hectares) of which are in critical habitat (existing);
- The approximately 400-acre preserve and research station for the Houston toad adjacent to Griffith League Ranch (existing);
- The Robert K. Long Safe Harbor Agreement covering 540 acres (219 hectares) within the permit area (existing);
- Other proposed safe harbors within the proposed permit area;
- Boy Scouts of America Safe Harbor Agreement on the Lost Pines Scout Reservation covering approximately 500 acres (202 hectares) within the permit area (proposed);
- University of Texas property adjacent to Buesher State Park covering 717 acres (290 hectares) within the permit area (existing);
- LCRA lands adjacent to Lake Bastrop covering 2,137 acres (865 hectares) within the permit area (portions of this area contain existing development) (existing);
- A considerable amount of research and monitoring within the permit area (existing);
- Texas Parks and Wildlife Department, and Fish and Wildlife Service habitat enhancement projects within the permit area (proposed and existing);
- Pines and Prairies Land Trust Yegua Knobs Preserve covering 302 acres (122 hectares) within the permit area (existing).

Within the Lost Pines, approximately 13 percent (15,887 acres [6,429 hectares]) of the toads' current and former range is in public ownership or under some form of management for the toad. This percentage includes 4,848 acres covered under the Boy Scout's habitat conservation plan, with much of this acreage being protected and managed for the toad. Additionally, the Robert Long Safe Harbor includes approximately 540 acres being enhanced for the Houston toad. Figure 3 identifies all lands within, and adjacent to, the proposed permit boundary that are public, or are currently being protect and managed for the Houston toad. With the exception of Camp Swift, all identified lands are known or believed to contain Houston toads.

Figure 3. Public lands, and other lands that are currently being managed for the Houston toad within and adjacent to the proposed permit area.

6.0 EFFECTS OF THE ACTION

Introduction.

The Houston toad is the only listed or proposed species likely to be incidentally taken as a result of the preferred alternative. Therefore, Houston toad is the only species that will be discussed in this section.

The Houston toad population within the proposed permit area is unknown, but may be on the order of a few to several thousand adult toads. It is unlikely that toads are uniformly distributed throughout the proposed permit area. Toad density within covered project areas may vary from zero in areas of non-habitat up to an average of one toad every 7 to 38 acres (2.8-15.4 hectares) in occupied toad habitat. Apart from populations on public lands and Griffith League Ranch, toad densities throughout the approximately 142,526-acre proposed permit area have not been determined.

Not all of the proposed permit area supports ideal habitat for Houston toads. The proposed permit area contains natural areas lacking habitat characteristics preferred by the species, as well as areas that have been heavily disturbed by human activities. Since much of the proposed permit area has not been intensively surveyed, and the absolute distribution of the species is not known, the percentage of the proposed permit area that is not habitat for Houston toads is unknown. However, the Utilities and the Service believe that approximately 50 percent of the proposed permit area has been heavily disturbed by past human activities and, as such, does not provide ideal habitat for the species. Since occupied, unoccupied, and non-habitats are interspersed, an attempt was made to include all habitat areas that also corresponds to the Utilities area of service. This is the 142,526-acre proposed permit area (Figure 1).

The number of Houston toads that would be killed, harmed, or harassed by activities authorized under the requested permit cannot be quantified. With the resources currently available, it is not possible to identify all areas of occupied Houston toad habitat within the approximately 142,526-acre proposed permit area, estimate toad population size or density within project areas, or locate the future sites of projects that would be undertaken in response to requests for services. Therefore, an accurate assessment of take in terms of the number of Houston toads affected is not possible.

As discussed below, an accurate assessment of take in terms of habitat units is also speculative. Over the vast majority of the activity area, adverse impacts to Houston toad habitat are highly unlikely, but take may occur and result in death or harm to individual toads, primarily through vehicle/equipment strikes, excavation activities, and habitat modification. A total of approximately 6,791.6 acres (2,748.5 hectares) are included in the activity area and are considered in the permit application. While not all of the activity area is likely to occur within Houston toad habitat, it is possible that any particular activity within the proposed permit area may result in take of Houston toads since the distribution of occupied habitat within the covered area is unknown. However, it is also recognized that many activities authorized by the permit are not likely to result in incidental take.

In an effort to quantify impacts, the following is provided: The requested permit would authorize all proposed activities within 6,791.6 acres (activity area) of the 142,526-acre proposed permit area. Within this area, covered activities occurring within existing maintained ROWs (approximately 4,264.3 acres [1,725.7 hectares] or 62.8 percent of the activity area) are unlikely to adversely affect Houston toad habitat but do have the potential to directly impact individual toads. Maintenance/repair activities performed at existing facilities outside of ROWs (approximately 2,000.4 acres [809.6 hectares] or 29.5 percent of the activity area) may result in temporary alteration of Houston toad habitat, but are unlikely to result in the permanent loss of toad habitat. The potential for similar activities outside of maintained ROWs to directly impact individual toads is greater than within maintained ROWs. Activities occurring in existing maintained ROWs or at existing facilities outside of ROWs would be conducted within approximately 6,264.7 acres (2,535.3 hectares) or about 92.2 percent of the activity area.

Construction of new facilities would occur on up to 2,550.4 acres (Tables 6 and 7). It is anticipated, based on distribution of existing facilities and following the BMPs, that most (79.3 percent) of the area occupied by new facilities would occur within existing maintained ROWs; the remaining 526.9 acres occupied by new facilities is projected to occur outside of existing maintained ROWs (Tables 6 and 7). Within these 526.9 acres the probability of impacting the toad is the greatest. However, under the BMPs (Section 6), much of this area would be located outside existing Houston toad habitat and/or would be allowed to re-vegetate back to its previous or a similar condition. Construction of new facilities has the potential to kill or injure toads primarily through vehicle/equipment strikes and excavation activities. Potential for impacts to breeding sites would largely be avoided through adherence to the BMPs.

Routine maintenance and repair would initially occur on the approximately 4,241.2 acres (1,716.4 hectares) containing existing facilities (Tables 5, 6, and 7). Maintenance and repair would not occur consistently or continuously throughout this area but would occur in response to the need for repair or in accordance with cyclic maintenance schedules. The area containing existing facilities would increase incrementally over the life of the permit as new facilities are constructed, thus the area in which maintenance and repair activities would be conducted would increase over the life of the permit from approximately 4,241.2 acres up to 6,791.6 acres (Tables 6 and 7). Any direct impacts to toads resulting from routine maintenance and repair are likely to be caused by vehicle/equipment strikes and excavation activities. Maintenance of facility easements could result in minor, localized, and temporary decreases in quality of foraging and sheltering habitat.

Activities occurring within the approximately 88 acres (35.6 hectares) occupied by existing fixed-foundation facilities are not likely to cause adverse effects to Houston toads. Fixed-foundation facilities generally consist of structures such as lift stations, electrical substations, and pump stations that do not provide habitat resources for toads. Existing fixed-foundation facilities comprise approximately 1.3 percent of the 6,791.6-acre area in which activities are expected to be performed by the Utilities over the life of the permit.

As stated previously, approximately 526.9 acres would contain new installations outside of existing ROWs. Activities related to new construction in these areas have the potential to eliminate Houston toad habitat, decrease Houston toad habitat viability, and directly harm

Houston toads through vehicle/equipment strikes and excavation work. Based upon the known environmental baseline (Section 5.0), it is reasonable to assume approximately 50 percent of these installations will occur in non-habitat or habitat that has previously been disturbed. Additionally, the Utilities and the Service believe the potential for direct harm to toads is low assuming adherence to the BMPs and because of the low density at which toads are expected to occur within the proposed permit area. Significant habitat fragmentation is unlikely to result from covered activities because project areas are expected to continue to possess habitat value, or be allowed to revegetate back to previous or similar conditions, and clearing associated with the activities would generally occur in narrow, linear swaths.

6.1 Direct Effects

Some potential exists for activities covered under the requested permit to result in death of, or injury to, Houston toads. Death or injury may occur from vehicle or equipment strikes, toads being unearthed during ground-disturbing activities, and toad eggs and/or tadpoles being destroyed if breeding/nursery sites are damaged. These impacts could occur as a result of construction of new facilities or during routine maintenance and repair. However, the potential for covered activities to cause death of, or injury to, toads is not uniform throughout the proposed permit area. Not all of the proposed permit area is suitable toad habitat and activities occurring in non-habitat would not be expected to kill or injure toads. Adherence to the BMPs (described in Section 6.1 of the EA/HCP) would serve to minimize the number of covered activities occurring within toad habitat and minimize the number of activities being performed during the toad's breeding season.

In those portions of the proposed permit area where Houston toads occur, the potential for toad injury or mortality is expected to be lessened by the BMPs that were designed to avoid and minimize impacts to toads and toad habitat. Most activities are expected to occur at times of the year when toads are not breeding, be performed in areas where toads are less likely to occur, and be conducted in a manner that minimizes the potential for harm to toads.

The potential for death or injury is also expected to be low because of the low density occurrence of Houston toads within the proposed permit area. While the Houston toad population within the proposed permit area is unknown, based on studies that have been conducted, the population is estimated to be a few to several thousand adults. Accordingly, excluding the breeding season when toads would be expected to be concentrated in the vicinity of breeding sites, toad density throughout the proposed permit area likely averages about one adult toad every 14.3 to 47.5 acres (5.8 to 19.2 hectares) (based on a 142,526-acre proposed permit area and an adult toad population of 3,000 to 10,000). This is consistent with Forstner's estimation of 1 adult toad per 25 acres (10.1 hectares) (Forstner 2003). Actual average density of toads within the proposed permit area more likely ranges from zero in non-habitat areas to one adult toad every 7.1 to 38.0 acres in habitat areas (based on a population of 3,000 to 10,000 adult toads and the broad assumption that 50 to 80 percent of the proposed permit area contains toad habitat). As most activities would occur during the times of the year when toads were dispersed from breeding sites (as dictated by the BMPs), and based on the expected low density of toad occurrence, vehicle strikes are expected to be rare. Similarly, the probability of striking or unearthing a toad at any given site while

excavating for an underground line, installation of utility poles, or to effect line repair is also expected to be very low, but is not zero. However, when the proposed activities are considered in aggregate, it is expected that some number of Houston toads would be harmed eventually, based on the proposed number of projects, expected frequency of activities, and the length of time involved. Impacts in areas of toad concentrations or to toad breeding/nursery sites would generally be precluded by adherence to the BMPs.

Habitat Fragmentation. In general, ground clearing activities, substantial soil disturbances, and construction activities have the potential to decrease suitability of Houston toad habitat by fragmenting habitat and locally altering native vegetation and soils. Such disturbances could either eliminate resources required by Houston toads or cause habitat to become more favorable for competing species. With regard to the proposed activities, most are not expected to adversely affect Houston toad habitat. Approximately 62.8 percent (approximately 4,264.3 acres out of 6,791.6 acres) of covered facilities occur, or would be placed in, existing maintained ROWs (Tables 6 and 7). Existing ROWs occur primarily along roadsides and are generally kept cleared of woody vegetation. Any detrimental effects to toad habitat that may have been caused by creation of these ROWs (e.g., habitat fragmentation) are not expected to be compounded by performance of covered activities in these same areas. Therefore, activities occurring in approximately 62.8 percent of the activity area are not expected to further fragment or otherwise alter existing Houston toad habitat.

Approximately 37.2 percent (approximately 2,527.3 acres [1,022.8 hectares] out of 6,791.6 acres) of activities would occur outside of existing ROWs (Tables 6 and 7). Of this approximately 2,527.3 acres, approximately 2,000.4 acres (roughly 29.5 percent of the activity area) contain existing facilities. No significant clearing of vegetation would occur in these areas and activities would generally be restricted to routine maintenance and repair. Accordingly, activities occurring in the approximately 2,000.4 acres would not be expected to alter any toad habitat beyond the level at which it was fragmented or otherwise disturbed by the initial facility construction. Thus, activities occurring in approximately 92.2 percent [(4,264.3 + 2,000.4) / 6,791.6] of the activity area are not expected to further fragment or otherwise adversely alter Houston toad habitat.

The remaining approximately 7.8 percent of the activity area (0.37 percent of the proposed permit area) consists of the approximately 526.9 acres of new facilities that may be constructed outside of existing ROWs. Although, adherence to the BMPs, including locating new facilities within existing ROWs to the maximum extent practicable would likely further reduce this acreage figure. Of this area, approximately 50.4 acres (20.4 hectares) may be occupied by fixed facilities (Tables 1 through 3). Adherence to the BMPs would minimize the extent to which any of the fixed facilities would be placed in Houston toad habitat, but the potential exists for construction of fixed facilities that would permanently remove and fragment Houston toad habitat. Some potential exists for vegetation clearing and other activities to occur in the remaining approximately 476.5 acres (192.8 hectares) (526.9 – 50.4), but since much of these areas would be allowed to revegetate to previous conditions, these activities generally would not be expected to permanently remove all of the biological value.

Breeding. As previously discussed, not all of the proposed permit area contains toad habitat and, therefore, not all new facilities occurring outside of existing ROWs would be constructed in Houston toad habitat. Many activities that are conducted in toad habitat are not expected to permanently eliminate habitat viability with regard to meeting the breeding, feeding, and sheltering needs of the Houston toad. LCRA and the Texas Department of Transportation have conducted several surveys documenting the occurrence of breeding activity within their ROWs. One such survey concluded the Houston toad is a common inhabitant along the surveyed transmission lines (EH&A, Inc. 1992). Additionally, Houston toads have been observed exhibiting breeding behavior in other maintained ROWs, roadside ditches, manmade ponds, flooded fields and pastures, residential areas, and formerly, at aquatic sites near runways on Ellington Air Force Base (USFWS 1984; Forstner 2002a, 2002b, 2003; Price 1992, 1993 C. Berkhouse, SWCA, pers. comm. 2002). Since potential breeding sites are to be avoided to the maximum extent practicable, and no clearing or ground disturbance is to occur within 150 feet of these potential breeding sites during the breeding season, disturbances associated with covered activities are not expected to alter the number of potential breeding sites available to Houston toads or deter toads from breeding. Consequently, construction of new linear facilities would be expected to have minimal impacts on the ability of land to provide potential breeding sites for the Houston toad.

Foraging. Clearing of vegetation associated with performance of covered activities is not expected to significantly impair Houston toad foraging. Houston toads feed primarily on terrestrial invertebrates, and currently occupy habitats ranging from woodland to savannah (USFWS 1984; Campbell 1995). Because clearing of vegetation would typically occur in narrow, linear swaths, the vegetation community structure in and surrounding a given project area following clearing would be expected to remain within the structural range occupied by the species. Upon completion of activities, project areas would re-vegetate and adherence to the BMPs (see Section 6.1.2) related to ROW management would result in the natural succession of plant life to occur. This vegetation would be expected to be capable of supporting a variety of invertebrate species and, therefore, any Houston toads present in the vicinity of the project areas would be expected to ultimately continue foraging in those areas. Disturbances in project areas would likely result in a temporary decrease in abundance of potential prey items within project areas.

Sheltering. Disturbance associated with covered activities is not expected to significantly alter the soil profiles such that toads would be unable to burrow for aestivation/hibernation. Adherence to the BMPs (see Section 6.1.2) related to ROW management would result in natural succession of plant life providing surface cover for toads. While construction in project areas would result in a temporary decrease in ground cover in those areas, given the total area available to toads compared to the area that would be impacted by individual proposed activities, any temporary decrease in the amount of potential sheltering area available to Houston toads is not considered significant.

6.2 Indirect Effects

"Indirect effects" are defined by the Act's regulations as effects that are caused by a proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). In order to address the potential indirect effects of the Preferred Alternative, it is first necessary to identify events that would be reasonably certain to occur in the Permit Area as a result of the Preferred Alternative (i.e., those events with a causal link to the Preferred Alternative) and separate those from events that either are not reasonably certain to occur or that are reasonably certain to occur but would occur independent of activities performed by the Utilities.

Potential indirect effects resulting from the proposed activities of the Utilities fall into two distinct categories: (1) those with the potential to result from the direct impacts to soils and vegetation caused by performance of the proposed activities ("site-specific effects"); and (2) those that could result from increased availability of utility service within or outside of the permit area ("growth-related impacts"). The general types of indirect effects with potential to adversely affect the Houston toad are introduced and described in Section 3.3.2 of the EA/HCP. Site-specific effects and growth-related effects as they pertain to the proposed action and the environmental factors tracked in this document are discussed individually below.

Indirect Site-specific Effects

As discussed in Section 4.1 of the EA/HCP, the Utilities are proposing to perform three general types of activities: (1) installation of new utility lines and fixed facilities; (2) maintenance and repair of existing facilities; and (3) construction of new recreational facilities, including fences (LCRA only). Overall, maintenance and repair of existing facilities is not expected to result in significant indirect impacts. Any changes in vegetation and wildlife habitat values adjacent to these facilities would have been induced by the original clearing of vegetation associated with installation of these facilities. Accordingly, the following discussion focuses on the potential for new construction of utility lines and recreational facilities to indirectly effect the Houston toad.

Vegetation and Habitat Fragmentation. In general, the clearing of vegetation, such as that which could occur during performance of some of the proposed activities, has the potential to result in indirect and localized effects to adjacent undisturbed vegetation. Those potential effects, if realized, then have the potential to affect the Houston toad. Effects to vegetation can be caused by increased availability of sunlight along newly created edge and increased exposure to wind, which can lead to drying of microclimates. Effects to the Houston toad could then result from consequent changes in vegetation community composition and structure (changed habitat conditions). The degree to which these effects manifest themselves depends on the structure of the local vegetation community (open communities are much less affected than closed communities since open communities are regularly exposed to sunlight and wind) and on what, if anything, is placed in the cleared area (e.g., a blacktopped parking lot may have greater effect on adjacent microclimate than might a grassy picnic area).

Habitat conversion and fragmentation make the Houston toad more vulnerable to predation, competition, and hybridization. Removal of trees acts to exacerbate the effect of drought on a

local scale by increasing heat at ground level and consequent moisture loss from the soil, which makes the deforested area unsuitable for Houston toads that need to burrow to escape desiccation (Forstner 2003). Clearing of vegetation for facilities outside of the existing ROW can result in fragmentation of habitats.

Covered activities could alter Houston toad habitat to such an extent that it could become more favorable for potential inter-specific competitors such as Woodhouse's or Gulf Coast toads. Covered activities would largely consist of narrow, linear projects. Since the proposed BMPs would be followed, and many of these ROWs would be allowed to revegetate back to the previous condition, covered activities would not be expected to result in significant landscape-scale changes that would alter the make-up of local faunal communities. Many paved and unpaved linear clearings cross through Houston toad habitat (e.g., utility ROWs, roads in Bastrop State Park, U.S. Highway 290, and State Highway 21) and have been present in that habitat for many years. Since Houston toads continue to occur adjacent to these clearings, it is expected that toads would continue to occur adjacent to linear clearings resulting from covered activities.

The Houston toad is also sensitive to habitat patch size. The Houston toad is believed to do best in large blocks of habitat with minimal disturbance and fragmentation. Over time the Preferred Alternative may result in minor fragmentation of occupied habitat and thus, may contribute to the take of Houston toads and/or loss of habitat viability in Bastrop and Lee counties. Utility lines that bisect larger habitat patches will contribute towards this fragmentation. Large habitat patches generally contain larger animal and plant populations with lower extinction probabilities, and these larger patches tend to be occupied more often than smaller ones (Soule et al. 1992). Habitat fragmentation contributes to the genetic isolation of populations or population fragmentation (which in turn can reduce genetic variation and viability necessary to produce healthy offspring). This increases the risk of extinction by reducing survival, reproduction, and dispersal. Isolation also precludes recolonization should one or more populations be eliminated. These risks are compounded when populations are surrounded by an inhospitable environment that continually imposes a high degree of threats on the remnant habitat (Denton et al. 1997; Laan and Verboom 1990; Reh and Seitz 1990; Soule et al. 1992; Pechmann and Wilbur 1994; Shafer 1997; Gibbs 1998; Semlitsch 1998; Vos and Chardon 1998). As numbers of populations are reduced and numbers of individuals in populations decline, the species also becomes vulnerable to catastrophic events, such as severe and prolonged drought conditions. Droughts may reduce small populations to such low numbers that they are unable to recover (Soule et al. 1992; Pechmann and Wilbur 1994; Forstner 2003).

As summarized in Section 5.1.1.1 of the EA/HCP and Tables 5 through 8, installation of new facilities would occur on approximately 2,550.4 acres, with approximately 2,023.5 acres of these new facilities expected to be installed in existing managed and maintained ROWs, and approximately 526.9 acres of new facilities are anticipated to be installed outside of existing ROWs. Installation of new facilities in existing ROWs would not be expected to result in significant indirect effects to vegetation or the Houston toad because disturbances associated with installation of these facilities would not result in the creation of any new edges to the adjacent vegetation communities or result in additional habitat fragmentation.

Installation of new facilities on the approximately 526.9 acres located outside of existing ROWs would require new clearing of vegetation. As discussed, approximately 476.5 acres of this would be attributed to new linear facilities and upgrades to utility lines, and approximately 50.4 acres would be attributed to new fixed-foundation facilities. Also as discussed, it is largely unknown where new facilities would be installed and, therefore, it is not possible to quantify expected indirect impacts to vegetation resulting from installation of new facilities. It is however reasonable to assume that at least 50 percent of the 526.9 acres would be located outside of Houston toad habitat (see Environmental Baseline Section 5.0). Additionally, since the BMP's will be followed, no clearing or construction activities would occur on lands the Service recognizes as being managed as a preserve for the Houston toad.

Fire ants. Fragmentation can also result in changes in wildlife community structure unrelated to changes in vegetation. For example, clearing of vegetation in a particular area might allow that area to become infested by fire ants, with those ants then foraging heavily in adjacent undisturbed and unchanged vegetation. Subsequently, the ants could alter the local invertebrate community structure and adversely affect the availability of prey items. New clearing could allow densities of fire ants to increase in localized areas, but because fire ants undoubtedly occur throughout the permit area, any such increases would have very localized effects on invertebrates and other wildlife. Whether any such increases would result in adverse impacts to Houston toads is unknown, although some potential may exist for localized increase in fire ant density to result in localized decrease in the availability of prey items to individual Houston toads or increased rates of predation on toadlets by fire ants. Adherence to the BMPs (Section 6.1.2) should minimize the potential for the proposed activities to result in propagation or spreading of fire ants in the permit area.

Breeding Sites. In general, installation of new facilities outside of existing ROWs would not be expected to result in indirect effects to potential breeding sites because these sites would largely be avoided through adherence to the BMPs. If canopy vegetation was cleared from over a wetland, it could result in changes to the composition of the plant community contained in that wetland, with reduction in the number and/or density of shade-dwelling plant species, and increases in number and/or density of plant species that require partial or full sun.

Pesticides and Other Contaminants. As discussed in section 3.3.2 of the EA/HCP, the use of herbicides, pesticides, and fungicides is acknowledged to have potential harmful effects on amphibians and some habitats. The Utilities have requested the use of certain herbicides and pesticides within their ROW. While it is not necessary to include herbicides and other similar chemicals under the requested permit, since the U. S. Environmental Protection Agency is responsible for registering/approving their use (a regional section 7 consultation has occurred covering incidental take to federally listed species), the utilities have elected to incorporate additional protective measures. The actual indirect effects of using these contaminants are unknown. However, by following the BMP's their use will be minimized, and the Utilities will follow the Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service (2004). Additionally, all label requirements will be followed, and only the least-toxic, non-persistent herbicide shall be selected for use.

Indirect Growth-related Effects

This section addresses the potential for the proposed activities to indirectly affect the Houston toad by causing human population growth and development inside and outside of the permit area. Again, indirect impacts are those effects caused by a proposed action that are later in time *and* are reasonably certain to occur. Hence, in order to assess indirect growth-related impacts of the proposed activities, it is first necessary to examine the issues of causation and when, within the meaning of applicable Act regulations, causal effects are considered reasonably certain to occur. These issues are examined in Appendix A. Following this section, connection between the proposed activities of the Utilities and future growth is tested for causation and reasonable certainty, both outside and inside of the permit area.

Discussion of Potential Indirect Growth-related Effects

The Service has issued a section 10(a) permit for 46 subdivisions in Bastrop County. Individual lot-owners within the 46 subdivisions can participate by paying money into a fund, which thereby authorizes incidental take of Houston toads during construction and occupation of single-family residences. This permit covers more than 9,200 residential lots on more than 6,600 acres (2,671 hectares), all occurring within the permit area of the Utilities. Accordingly, this plan allows for a significant amount of residential development to occur within the permit area, with that development then considered "immune" from discussions of indirect growth-related effects in this EA/HCP because the effects of that growth would have been addressed in the 46 subdivisions EA/HCP.

In addition, the Bastrop County Lost Pines HCP regional section 10(a) permit that is currently in the development phase seeks to provide a streamlined method of authorizing incidental take of Houston toads during construction and occupation of some single-family, commercial, multi-family, and subdivision developments in an approximately 124,000-acre portion of Bastrop County. Should this plan be approved as currently conceived, Act authorization of development, including authorization for those impacts expected to result from installation of utilities, would be achieved through purchase of "participation certificates" with monies raised used to fund Houston toad habitat creation or enhancement projects on privately held lands. Not only would this plan provide a mechanism for obtaining Endangered Species Act authorization for much of the development expected to occur in Bastrop County over the next 30 years, it would be authorizing most of the development that would be served by the Utilities. Any development occurring through participation in the Bastrop County Lost Pines HCP would similarly be "immune" from discussions of indirect effects in this EA/HCP.

As it cannot be known with certainty where any future development may occur in the permit area, potential indirect effects of such development can only be discussed in general terms. Development occurring without participation in the 46-subdivision plan or the Lost Pines HCP would contribute to the fragmentation of habitats, some of which could be habitat for the Houston toad. If that fragmentation were to occur in wooded habitat, that fragmentation could cause localized vegetative edge effects and localized modification to Houston toad habitat.

It is important to note that, as discussed under the No Action Alternative (Section 4.4), it is considered likely that the Utilities would continue to conduct their activities in the permit area in absence of issuance of a section 10(a) permit. Also, because of the very low chance that any particular activity would result in adverse effects to Houston toads, with the exception of LCRA, it is considered likely that the Utilities would conduct their activities in a manner to avoid or minimize the potential to harm toads and without consultation with the Service. Consequently, the potential indirect growth-related effects of the Proposed Alternative as described above have similar potential to occur under the No Action Alternative, but without the benefit of the mitigation measures proposed by the Utilities and, possibly, without incorporation of some of the BMPs.

In order to further ensure indirect effects are adequately addressed, the Service, Aqua, and BEC have an understanding in which Aqua and BEC have decided to provide to landowners requesting new service in portions of Bastrop and Lee counties an information sheet summarizing issues related to the Houston toad and its habitat, the Act, incidental take, and incidental take permits. The information sheet also includes Service contact information. These entities require the landowner to sign a form indicating that they understand the information sheet, and the form is maintained in their records. By signing this form it clarifies they are not responsible for any direct or indirect effects associated with the customer's actions.

6.3 Interrelated and Interdependent Actions

There are no additional interrelated or interdependent actions related to the proposed action.

6.4 Critical Habitat

Critical habitat for the Houston toad was proposed in May 1977 and finalized in March 1978 (Federal Register 43:4022-4026). The determination of critical habitat for the Houston toad was one of the early designations under the recently passed Act, and that designation would not meet the Service's current standards for a designation of critical habitat. The final rule designated two areas as critical habitat, one in Bastrop County and one in Burleson County. We now know that in both of these areas there are large areas that are not considered to be habitat for the Houston toad. Within the 142,526-acre permit boundary approximately 67,214 acres are within the boundaries of the designated critical habitat in Bastrop County.

In addition to requiring that the issuance criteria under section 10 of the Act be met, the Service also has to ensure that its own actions, in this case the issuance of a section 10 permit, do not "jeopardize the continued existence of any federally listed species or result in the destruction or adverse modification of designated critical habitat. The implementing regulations of section 7 define "jeopardize" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species." This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, the Service has relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

The 1978 designation of critical habitat for the Houston toad predates the 1984 regulations (50 CFR 424.12) that refined the designation of critical habitat process. It is clear that designating any large area of land or water as critical habitat for a species will include habitat that is not suitable for the species. As a consequence, the 1984 regulations added the concept of "primary constituent elements" to the designation process: "When considering the designation of critical habitat, the Secretary shall focus on the principal biological or physical constituent elements within the defined area that are essential to the conservation of the species. Known primary constituent elements shall be listed with the critical habitat description. Primary constituent elements may include, but are not limited to, the following: roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types." Under the current methods of designating critical habitat, habitat is only considered to be critical habitat if it is within the boundaries of the geographically defined area and has one or more of the primary constituent elements.

The 1978 designation did not specifically recognize the habitat used by Houston toads, although the designation does refer in general terms to "habitat" without further definition. In one instance, the final rule states: "The one mile radius circle around Woodrow Lake includes all known Houston toad localities in Burleson County, the soil type (sand) conforms to the weak burrowing habitats suggested for this species and both temporary and permanent ponds are found throughout the proposed area." Finally, when specifying the geographical boundaries of habitat designated critical for the Houston toad, the rule states: "Texas-Areas of land, water, and airspace....." Currently, the Service would recognize that water (ephemeral ponds, permanent ponds, and slow flowing creeks or streams), deep friable sandy soils, and forest are habitat components essential to the species. For the purposes of this EA/HCP, these constituent elements would be best represented within the habitat areas outside of existing ROW. Because both the Utilities and the Service consider all suitable habitat within the permit boundary as occupied, any action that impacts suitable habitat would also be considered to impact the species.

The determination of jeopardy or adverse modification of critical habitat applies to the listed entity, in this case, the Houston toad throughout its range, which includes nine Texas counties, although the toad may no longer occur in two of these counties. Unfortunately, the Service does not know the current status of the species throughout most of its range, but the proposed permit area constitutes only a portion of the species' overall range and impacted habitat (better quality habitat is likely outside of existing ROW) within the proposed permit boundary is even a smaller portion (0.37 percent of the permit area, see Table 7). An even smaller portion of this is actually located within designated critical habitat.

The total area of critical habitat within Bastrop County is approximately 98,000 acres (39,660 hectares). Of which approximately 67,214 acres of designated critical habitat is located within the proposed permit area, and approximately 75,312 acres of the proposed permit area is located outside of designated critical habitat for the species. Of this area, approximately 13,000 acres (5,261 hectares) is currently protected or being managed for the benefit of the species. Critical habitat represents approximately 47 percent of the permit area. Assuming no emphasis is placed on projects within or outside of critical habitat, it is reasonable to assume that approximately 53

percent of the 526.9 acres of new facilities outside of existing ROW will not be located within designated critical habitat. Of the 47 percent that is located within designated critical habitat, approximately 48 percent has already been degraded (urbanization, agriculture, etc). This is based upon the information provided in the Environmental Baseline (Section 5.0). Therefore, a reasonable assumption could be made that only 118.8 acres (48.1 hectares) of designated critical habitat, that currently contains the appropriate constituent elements, would be subject to impact. These 118.8 acres would be distributed throughout the 67,214 acres that is designated critical habitat within the proposed permit boundary. The following percentages are provided to identify the scale of impact to critical habitat (118.8 acres) that could be expected from issuance of this permit:

- approximately 0.0035 percent of the designated critical habitat when considering the 48 percent loss from the environmental baseline
- approximately 0.0012 percent of the total critical habitat area in Bastrop County
- approximately 0.0017 percent of the total critical habitat located within the proposed permit area
- approximately 0.00083 percent of the proposed permit area

While this analysis is not intended to limit the amount of impact within designated critical habitat to 118.8 acres, it is likely this is an accurate reflection of what could be expected. It is also possible this analysis could be overestimated since the Utilities have proposed to avoid all potential habitat areas and breeding sites, regardless of whether it is located within critical habitat or not, to the maximum extent practicable.

By following the BMP's, impacts to these areas will be minimized and much of the biological components of these areas will remain intact, or be restored. Of utmost importance, no impacts would be authorized in areas known to contain the best quality habitat and highest population numbers, without prior Service approval. These are areas the Service recognizes as areas being managed as a preserve for the Houston toad. Additionally, based upon the Service's current understanding of the species, the vast majority of projects (92.2 percent) will be located within areas of non-habitat or areas that have been previously disturbed. Any take or impacts to the constituent elements of critical habitat associated with these projects would be minimal.

7.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 of the Act.

The proposed permit area is predominantly rural and includes the City of Bastrop and other smaller municipalities in both Bastrop and Lee counties. The population of Bastrop County is growing rapidly. This growth is probably largely due to the near proximity of the City of Austin, which has experienced substantial population growth, and the Austin Bergstrom International Airport, which is about 25 miles (40.2 kilometers) west of the City of Bastrop.

According to the U.S. Census Bureau (USCB), after showing a general decline from 1900 through 1960, the estimated population of Bastrop County has since grown steadily, from 16,925 in 1960 to 38,263 in 1990 (USCB 1995). The estimated population then grew to 57,733 by 2000, an increase of almost 51 percent over that decade (USCB 2002a). From 1 April 2000 to 1 July 2001 the population is estimated to have increased by about 7.5 percent (USCB 2002b).

The Texas State Data Center (TSDC) and the Center for Demographic and Socioeconomic Research and Education (CDSRE) developed population estimates for Bastrop County based on projections ranging from moderate growth to high growth (TSDC and CDSRE 2001). Based on these projections, the population of Bastrop County could range from 97,601 to 145,598 in 2020, 123,734 to 226,163 in 2030, and 153,392 to 344,904 in 2040. The TSDC and CDSRE (2001) recommend that the moderate-growth scenario is most appropriate for most counties during the present time, though no recommendation specific to Bastrop County is provided. According to population projections developed by the Texas Water Development Board (TWDB), the population of Bastrop County in 2020, 2030, and 2040, could be 77,030, 89,779, and 97,624, respectively (TWDB 2002). Despite its rapid population growth, Bastrop County remains largely rural.

The population of Lee County showed a general decline from 1900 to 1970, but has been growing steadily since, albeit at a rate lower than that in Bastrop County (USCB 1995 and USCB 2002a). The estimated population of Lee County grew from 12,854 in 1990 to 15,657 in 2000, an increase of almost 22 percent. From 1 April 2000 to 1 July 2001 the population is estimated to have increased by about 3.2 percent (USCB 2002b). Based on TSDC and CDSRE (2001) projections assuming moderate to high growth, the population of Lee County could range from 20,362 to 24,305 in 2020, 22,483 to 28,922 in 2030, and 24,194 to 32,925 in 2040. No recommendation specific to Lee County regarding the moderate-growth scenario recommended by TSDC and CDSRE is provided. According to population projections developed by the TWDB (2002), the population of Lee County in 2020, 2030, and 2040, could be 17,176, 18,144, and 19,408, respectively. Lee County is also largely rural.

The increasing population in Bastrop County, and to a lesser extent Lee County, will continue to pose a threat to the Houston toad through loss of habitat from urbanization, increased roads, traffic, and loss of potential breeding sites. In an effort to most effectively deal with these impacts the Service developed the 46-Subdivision HCP which was subsequently revised in 2001. This HCP provides a mechanism for individuals to easily and effectively gain authorization for their impacts to the Houston toad within 46 subdivisions. Further, in order to help address this rapid population increase, Bastrop County passed a resolution on October 21, 1999, stating the County would move forward with a Bastrop area HCP which would ensure the continued survival of the Houston toad while allowing for development. Since then the Service has worked with, and encouraged Bastrop County to develop this HCP. Drafts of the Lost Pines HCP have been submitted to the Service for comment and it is expected a permit will be issued in the future. The Service believes these more regional approaches are the appropriate mechanism for dealing with future State, Tribal, local, or private actions that are reasonably certain to occur.

Due to Lee County's rural nature and projected population growth, the Service believes future State, Tribal, local, or private actions that are reasonably certain to occur in Lee County are minimal.

The cumulative effects of the proposed action are described in the EA/HCP, section 5.1.3. The Preferred Alternative also includes an HCP that proposes mitigation to off-set potential impacts to Houston toads and their habitat. Mitigation would be determined on a project-by-project basis as described in Section 6.2 of the EA/HCP. All mitigation funding generated by this alternative would be available for conservation of the Houston toad and its habitat in Bastrop and Lee counties.

8.0 CONCLUSION

After reviewing the current status of the Houston toad, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the issuance of a section 10(a)(1)(B) permit for fulfillment of TE-078366-0 as proposed, is not likely to jeopardize the continued existence of the Houston toad, or adversely modify or destroy critical habitat.

9.0 INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering (50 CFR 17.3(c)). Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to a listed species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(3)(B)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action (in this case granting a permit to "take" the species in fulfillment of the proposed permit TE-078366-0) is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed Utilities HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize and mitigate these impacts to the maximum extent practicable. All conservation measures described in the HCP, together with any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR Section 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to

apply. If the Permitee fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

10.0 AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Houston toad is the only listed or proposed species likely to be incidentally taken as a result of the preferred alternative. Therefore, Houston toad is the only species that will be discussed in this section.

The Houston toad population within the proposed permit area is unknown, but may be on the order of a few to several thousand adult toads. It is unlikely that toads are uniformly distributed throughout the proposed permit area. Toad density within covered project areas may vary from zero in areas of non-habitat up to an average of one toad every 7 to 38 acres in occupied toad habitat. Apart from populations on public lands and Griffith League Ranch, toad densities throughout the approximately 142,526-acre proposed permit area have not been determined.

Not all of the proposed permit area supports ideal habitat for Houston toads. The proposed permit area contains natural areas lacking habitat characteristics preferred by the species, as well as areas that have been heavily disturbed by human activities. Since much of the proposed permit area has not been intensively surveyed, and the absolute distribution of the species is not known, the percentage of the proposed permit area that is not habitat for Houston toads is unknown. However, the Utilities and the Service believe that approximately 50 percent of the proposed permit area has been heavily disturbed by past human activities, or has never contained the necessary components of Houston toad habitat, and as such does not provide ideal habitat for the species. Since occupied, unoccupied, and non-habitats are interspersed, an attempt was made to include all areas of habitat that also corresponds to the Utilities area of service in this application. This is the 142,526-acre proposed permit area (Figure 1). No attempt has been made to quantify or delineate occupied, unoccupied, or unsuitable habitat within the approximately 142,526-acre proposed permit area.

The Habitat Conservation Planning Handbook (Service and NMFS 1996) states that "...proposed incidental take levels can be expressed ... in one of two ways: (1) in terms of the number of animals to be 'killed, harmed or harassed' if those numbers are known or can be determined; or (2) in terms of habitat acres or other appropriate habitat units to be affected generally or because of a specific activity, in cases where the specific number of individuals is unknown or indeterminable." The number of Houston toads that would be killed, harmed, or harassed by activities authorized under the requested permit cannot be quantified. The Utilities cannot identify all areas of Houston toad habitat within the approximately 142,526-acre proposed permit area, estimate toad population size or density within project areas, or locate the future sites of projects that would be undertaken in response to requests for services. Therefore, an accurate assessment of take in terms of the number of Houston toads affected is not possible.

As discussed below, an accurate assessment of take in terms of habitat units is also speculative at best. Over the vast majority of the activity area, adverse impacts to Houston toad habitat are highly unlikely, but the potential does exist in those same areas for activities to result in death or harm to individual toads, primarily through vehicle/equipment strikes, excavation activities, and habitat modification. A total of approximately 6,791.6 acres are included in the activity area and are considered in this permit application. While not all of the activity area is likely to occur within Houston toad habitat it is possible that any particular activity within the proposed permit area may result in take of Houston toads since the distribution of occupied habitat within the covered area is unknown. However, it is also recognized that many activities authorized by the permit are not likely to result in incidental take.

In an effort to quantify impacts the following is provided. Under this EA/HCP, the Service believes using acres of potential habitat is the most ideal surrogate for determining impacts to the Houston toad. Therefore, this opinion uses acreage of habitat as a surrogate for the quantity of take that will occur in the form of kill, harm, and harassment that may occur. The requested permit would authorize all proposed activities within 6,791.6 acres (activity area) of the 142,526-acre proposed permit area. Within this area, covered activities occurring within existing maintained ROWs (approximately 4,264.3 acres or 62.8 percent of the activity area) are unlikely to adversely affect Houston toad habitat but do have the potential to directly impact individual toads. Maintenance/repair activities performed at existing facilities outside of ROWs (approximately 2,000.4 acres or 29.5 percent of the activity area) may result in temporary alteration of Houston toad habitat, but are unlikely to result in the permanent loss of additional toad habitat. The potential for similar activities outside of maintained ROWs to directly impact individual toads is greater than within maintained ROWs. Activities occurring in existing maintained ROWs or at existing facilities outside of ROWs would be conducted within approximately 6,264.7 acres or about 92.2 percent of the activity area.

Construction of new facilities would occur on up to 2,550.4 acres (Tables 6 and 7). It is anticipated, based on distribution of existing facilities and following the BMPs, that most (79.3 percent) of the area (approximately 2,023.5 of the 2,550.4 acres) occupied by new facilities would occur within existing maintained ROWs; the remaining 526.9 acres occupied by new facilities is projected to occur outside of existing maintained ROWs (Tables 6 and 7). Under the BMPs (Section 6) much of this area would be located outside existing Houston toad habitat and/or would be allowed to re-vegetate back to its previous or a similar condition. Construction of new facilities has the potential to kill or injure toads primarily through vehicle/equipment strikes and excavation activities. Additionally, further fragmentation of habitat will directly and indirectly impact the toad as described in section 6.0. Potential for impacts to breeding sites would largely be avoided through adherence to the BMPs.

Routine maintenance and repair would initially occur on the approximately 4,241.2 acres containing existing facilities (Tables 5, 6, and 7). Maintenance and repair would not occur consistently or continuously throughout this area but would occur in response to need for repair or in accordance with cyclic maintenance schedules. The area containing existing facilities would increase incrementally over the life of the permit as new facilities are constructed, thus the area in which maintenance and repair activities would be conducted would increase over the life of the

permit from approximately 4,241.2 acresup to 6,791.6 acres (Tables 6 and 7). Any direct impacts to toads resulting from routine maintenance and repair are likely to be caused by vehicle/equipment strikes and excavation activities. Maintenance of facility easements could result in minor, localized, and temporary decreases in quality of foraging and sheltering habitat.

As stated previously, approximately 526.9 acres would contain new installations outside of existing ROWs. Activities related to new construction in these areas have the potential to eliminate Houston toad habitat, decrease Houston toad habitat viability, and directly harm Houston toads through vehicle/equipment strikes, fragmentation of habitat, and excavation work. The Utilities and the Service believe the potential for direct harm to toads is low assuming adherence to the BMPs and because of the low density at which toads are expected to occur within the proposed permit area. Significant habitat fragmentation is unlikely to result from covered activities because project areas are expected to continue to possess habitat value and clearing associated with the activities would generally occur in narrow, linear swaths and oftentimes be allowed to revegetate to its previous condition.

As part of the preferred alternative, an HCP has been developed that specifies what steps the Utilities will take to avoid, minimize, and mitigate for impacts to the Houston toad and to assure that this alternative does not reduce the potential for survival and recovery of this species in the wild as mandated by requirements of 50 CFR Part 17.22(b)(1)(iii). The HCP is detailed in Section 6.0 of the EA/HCP.

All Federal agencies must assure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of the constituent elements essential to the conservation of the listed species within defined critical habitats (section 7(a)(2) of the Act, 50 CFR402, 50CFR17.94). In this biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. The Service believes the measures included in the EA/HCP will minimize and avoid take to the maximum extent practicable and that the terms and conditions of the HCP will provide significant benefits to the Houston toad.

11.0 EFFECT OF THE TAKE

In this biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat, and that implementation of the terms and conditions of the HCP could result in benefits to the Houston toad.

12.0 REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of Houston toads:

The Service shall require that the Applicant comply with and implement the issued section 10(a)(1)(B) incidental take permit and Implementing Agreement.

13.0 TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the following non-discretionary terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements, must be complied with:

The authorization granted by the permit is subject to full and complete compliance with, and implementation of, the EA/HCP for the Utilities in Bastrop and Lee counties, Texas, and all specific conditions contained in the permit and Implementing Agreement.

The reasonable and prudent measure, with its implementing term and condition, is designed to minimize the impacts of incidental take that might otherwise result from the proposed actions. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures.

14.0 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We recommend the following additional action for the listed species:

1. The Service will continue to coordinate all future section10(a)(1)(B) mitigation activities dealing with any or all of the species involved in this action with the mitigation program of this section 10(a)(1)(B) permit.

2. The Service will promote activities that enhance the use of potential corridors needed for migration. Maintaining connections among the habitat blocks is needed to promote the long-term viability of the populations they support. Since the toad may travel overland and along drainages, migration corridors should include both upland and riparian habitats.

3. The Service will provide technical support to the Utilities, promptly review their plans, support their efforts to further enhance Houston toad habitat, and provide them the latest scientific information.

4. The Service will continue to provide technical assistance and support for the Lost Pines HCP. Additionally, the Service will encourage the Utilities to continue being active members of the Lost Pines HCP effort.

5. The Service will meet, at least annually, with the Utilities and other entities as described in the EA/HCP, to ensure this EA/HCP is being implemented properly, adaptive management practices are being utilized, and mitigation funds are being expended appropriately for the benefit of the Houston toad.

15.0 REINITIATION NOTICE

This concludes formal consultation on the issuance of a permit pursuant to section10(a)(1)(B) of the Act to allow incidental take of the Houston toad during and following the fulfillment of the terms and conditions of permit number TE-078366-0 in Bastrop and Lee Counties, Texas. As required in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat designated not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

In future correspondence concerning this project, refer to permit number TE-078366-0. Please contact Scott Rowin at the Service's Austin Ecological Services Field Office at 512-490-0057 if you have any questions or would like to discuss any part of this biological opinion.

Approved:

Robert T. Pine, Field Supervisor — 2/17/05 Date

Concur:

(FOR) H. Dale Hall – Regional Director, Southwest Region — 8/19/05 Date

LITERATURE CITED

Bishop, C. and K. Petit (eds). 1992. Declines in Canadian amphibian populations: designing a national monitoring strategy. Occasional paper number 76. Canadian Wildlife Service. Ottawa, Ontario.

Bragg, A.N. 1960. Feeding in the Houston toad. Southwest Naturalist 5:106.

Brown, L. E. 1971. Natural hybridization and trend toward extinction in some relict Texas toad populations. Southwest Nat. 16(2):185-199.

Brown, L. E. 1975. The status of the near-extinct Houston toad (*Bufo houstonensis*) with recommendations for its conservation. Herpetol. Rev. 6(2):37-40.

Campbell, L. 1995. Endangered and Threatened Animals of Texas. Texas Parks and Wildlife Department. Austin, Texas.

Christein, D. and D. Taylor. 1978. Population dynamics in breeding aggregations of the American toad (*Bufo americanus*) (Amphibia, Anura, Bufonidae). Journal of Herpetology 12:17-24.

Dodd, C. and B. Cade. 1998. Movement patterns and the conservation of amphibians breeding in small, temporary wetlands. Conservation Biology 12(2):331-339.

deMaynadier, P. and M. Hunter. 1995. The relationship between forest management and amphibian ecology: a review of the North American literature. Environmental Review 3:230-261.

deMaynadier, P. and M. Hunter. 1998. Effects of silvicultural edges on the distribution and abundance of amphibians in Maine. Conservation Biology 12(2):340-352.

Denton, J., S. Hitchings, T. Beebee, and A. Gent. 1997. A recovery program for the natterjack toad (*Bufo calamita*) in Britain. Conservation biology 11(6):1329-1338.

Dixon, J. R. 1982. Final report: Houston toad survey. Texas A&M University. College Station, Texas.

Dixon, J. R. 1983. Survey of the Houston toad at the Caldwell, Texas, site. Final Report to the U.S. Fish and Wildlife Service under Contract No. 20181-0352.

Dixon, James. 1990. Houston toad *(Bufo houstonensis)* Highway 21 right of way survey. TAES NO. 55650-14-6463.

Dixon, J.R., N.O. Dronen, J.C. Godwin, and M.A. Simmons. 1990. The amphibians, reptiles, and mammals of Bastrop and Buescher State Parks: with emphasis on the Houston toad

(*Bufo houstonensis*) and the short-tailed shrew (*Blarina* sp.). Prepared for the Texas Parks and Wildlife Department. Austin, Texas.

Dronen, N. 1991. Investigation on vertebrate fauna at Bastrop State Park during fall, 1990, with emphasis on *Blarina* sp. (October 1, 1990 through February 2, 1991). Prepared for Texas Parks & Wildlife Department. Austin, Texas.

Espey, Huston & Associates, Inc. 1994. Results of Lake Bastrop Houston toad survey. July 7 letter report to S. Kuhl (LCRA) from G. Galbraith (EH&A). EH&A Job No. 13948-92.

Espey, Huston & Associates, Inc. 1995. Results of Houston toad surveys at the McNeil to Gideon transmission line project (EH&A Job No. 13948-173). Letter from Gary Galbraith, Espey, Huston & Associates, Inc. to Buddy Alcede, Lower Colorado River Authority. Austin, Texas.

Fahrig, L. and J. Pedlar, S. Pope, P. Taylor, and J. Wegner. 1995. Effect of road traffic on amphibian density. Biological Conservation 73: 174-182.

Fahrig, L. and G. Merriam. 1994. Conservation of Fragmented Populations. Conservation Biology 8: 50-59.

Findlay, C. and J. Houlahan. 1997. Anthropogenic correlates of species richness in southeastern Ontario wetlands. Conservation Biology 11(4):1000-1009.

Forstner, Michael R. J. 2000. Final Report, Griffith League Ranch Houston Toad Survey 2000, Bastrop County, Texas prepared for the Capitol Area Council, Boy Scouts of America. Austin, Texas. Unpublished.

Forstner, Michael R. J. 2001. Final Report, Griffith League Ranch Houston Toad Survey 2001, Bastrop County, Texas prepared for the Capitol Area Council, Boy Scouts of America. Austin, Texas. Unpublished.

Forstner, Michael R. J. 2002a. Houston toad research and surveys 2002 data and final report. Prepared for BSA/CAC-Lost Pines & Griffith League Ranch, Bastrop County, Texas, August 16, 2002.

Forstner, Michael R. J. 2002b. Final report of the 2002 Houston toad surveys in Bastrop County. Submitted to The Bastrop County Citizen's Workgroup, County Houston Toad Project, Bastrop, Texas.

Forstner, Michael R.J. 2003. Final: Biology/Ecology of the Houston toad (*Bufo houstonensis*). Prepared for the County of Bastrop, Texas, 3/10/03

Forstner, Michael R.J. and J.R. Dixon. 2000. An overview and genetic assessment of the occurrence of Houston toads on the Three Oaks Lignite Mine site. Final report submitted to Alcoa, Inc.

Freed, P.S. and K. Neitman. 1988. Notes on predation on the endangered Houston toad, *Bufo houstonensis*. The Texas Journal of Science 40(4): 454-455.

Gibbs, J. 1998. Amphibian movements in response to forest edges, roads, and streambeds in southern New England. Journal of Wildlife Management 62(2):584-589.

Harfenist, A., T. Power, K. Clark, and D. Peakall. 1989. A review and evaluation of the amphibian toxicological literature. Technical Report No. 61. Canadian Wildlife Service. Ottawa, Canada.

Hatch, S.L., K.N. Gandhi, and L.E. Brown. 1990. Checklist of the vascular plants of Texas. MP-16555. Texas A&M University, Texas Agricultural Experiment Station. College Station, Texas.

Hillis, D.M., A.M. Hillis, and R.F. Martin. 1984. Reproductive ecology and hybridization of the endangered Houston toad *(Bufo houstonensis)*. J. Herpetol. 18(1):56-71.

Houston Toad Recovery Team. 1999. March 31-April 1, 1999 Meeting Minutes. Prepared for USFWS. Austin, Texas.

Kennedy, J. P. 1961. Spawning season and experimental hybridization of the Houston toad, *Bufo houstonensis*. Herpetologica 17:239-245.

Kennedy, J. P. 1962. Spawning season and hybridization of the Houston toad, *Bufo houstonensis*. Herpetologica 17: 239-245.

Knutson, M., J. Sauer, D. Olsen, M. Mossman, L. Hemesath, and M. Lannoo. 1999. Effects of landscape composition and wetland fragmentation on frog and toad abundance and species richness in Iowa and Wisconsin, U.S.A. Conservation Biology 13(6):1437-1446.

Kuhl, J. 1997. Bullfrog (*Rana catesbeinana*) survey findings in NE Bastrop & SW Lee Counties – 1996-1997. March 24, 1997 memorandum from John Kulh, Hicks and Company, to Lisa O'Donnell, U.S. Fish and Wildlife Service. Austin, Texas

Laan, R. and B. Verboom. 1990. Effects of pool size and isolation on amphibian communities. Biological Conservation 54:251-262.

Little, Edward E., Robin D. Calfee, and Kimberly Dickerson. 2002. Determination of impacts on the endangered Wyoming toad (*Bufo baxteri*) at Mortenson National Wildlife Refuge from ammonium nitrate concentrations. Contaminant Report Number: R6/719C/02. U.S.

Geological Survey, Columbia, Missouri, and U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

Mader, H.J. 1984. Animal habitat isolation by roads and agricultural fields. Biological Conservation 29: 81-96.

Mader, H.J., C. Schell, and P. Kornacker. 1990. Linear barriers to arthropod movements in the landscape. Biological Conservation 54: 209-222.

Martin, R.F., D.M. Hillis, and D.T. Mosier. 1979. Surveys of Camp Swift Military Reservation and the Bastrop area for the endangered species, the Houston toad (*Bufo houstonensis*). U.S. Fish and Wildlife Service Final Report, Contract #14-16-0002-79-908.

Marsh, D. and P. Trenham. 2001. Metapopulation dynamics and amphibian conservation. Conservation Biology 15:40-49.

McBryde, J.B. 1933. The vegetation and habitat factors of the Carrizo Sands. Ecol. Mono. 3(2):247-297.

Pechmann, J. and H. Wilbur. 1994. Putting declining amphibian population in perspective: natural fluctuations and human impacts. Herpetological 50(1):65-84.

Porter, S.D., B. Van Eimeren, and L.E. Gilbert. 1988. Invasion of red imported fire ants (Hymenoptera: Formicidae): Microgeography of competitive replacement. Ann. Ent. Soc of America 81(6):913-918.

Porter, S.D., A Bhatkar, R. Mulder, S.B. Vinson, and D.J. Clair. 1991. Distribution and density of polygyne fire ants (Hymenoptera: Formicidae) in Texas. J. Econom. Entomol. 84(3):866-874.

Price, Andrew. 1990a. Houston toad status survey. Performance report. Project E-1-2, Job No. 8.0. Funded by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department under Section 6 of the Endangered Species Act. Austin, Texas.

Price, A. 1990b. Houston toad (*Bufo houstonensis*) status survey. Performance report: Project No. E-1-4, Job No. 8. Funded by U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department under section 6 of the Endangered Species Act. Austin, Texas.

Price, A. 1990c. Status of the Houston toad (*Bufo houstonensis*) along State Highway 21, Bastrop County, Texas. Submitted to the Texas Department of Highways and Public Transportation in fulfillment of Interagency Contract (90-91) 0860 330-0568. Texas Parks and Wildlife Department. Austin, Texas.

Price, Andrew. 1992. Houston toad *(Bufo houstonensis)* status survey. Final report: Project No. E-1-4, Job No. 8. Funded by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department under Section 6 of the Endangered Species Act. Austin, Texas.

Price, A. 1993. Houston toad (*Bufo houstonensis*) status survey. Final report: Project No. E-1-4, Job No. 8. Funded by U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department under section 6 of the Endangered Species Act. Austin, Texas.

Quinn, H. 1981. Captive propagation/release program of the Houston toad, *Bufo houstonensis.* Contract 20181-0498, Control Number 20181-0498. Final report prepared for the U.S. Fish and Wildlife Service. Albuquerque, New Mexico.

Quinn, H. and G. Ferguson. 1983. Release program for captive-raised and wild-caught Houston toads (*Bufo houstonensis*). Progress report for work completed from February through June 1983. Presented to U.S. Fish and Wildlife Service, Office of Endangered Species.

Quinn, H., G. Ferguson, and S. Mays. 1987. Captive propagation/release and relocation program for the endangered Houston toad, *Bufo houstonensis.* Progress report for work completed in 1987, presented to the Texas Parks and Wildlife Department and the U.S. Department of the Interior, Fish and Wildlife Service, Office of Endangered Species. Albuquerque, New Mexico.

Quinn, H. and G. Mengdon. 1984. Reproduction and growth of *Bufo houstonensis* (Bufonidae) Southwestern Naturalist 29(2):189-195.

Reh, W. and A. Seitz. 1990. The influence of land use on the genetic structure of populations of the common frog *Rana temporaria.* Biological Conservation 54:239-249.

Rudolph, D.C. and J. G. Dickson. 1990. Streamside zone width and amphibian and reptile abundance. The Southwestern Naturalist 35(4):472-476.

Sanders, O. 1953. A new species of toad, with a discussion of morphology of the bufonid skull. Herpetologica 9(1):25-47.

Science Applications International Corporation (SAIC). 2003. Texas Endangered Species Manual. Submitted to U.S. Environmental Protection Agency Region 6, Dallas, Texas.

Seal, U. 1994. Population and habitat viability assessment: Houston toad (*Bufo houstonensis*). Workshop conducted by IUCN/SSC Conservation Breeding Specialist Group in partial fulfillment of USFWS contract #94-172. Apple Valley, Minnesota.

Semlitsch, R. 1998. Biological delineation of terrestrial buffer zones for pond-breeding salamanders. Conservation Biology 12 (5):1113-1119.

Shafer, C. 1997. Terrestrial nature reserve design at the urban/rural interface. In: Conservation in Highly Fragmented Landscapes. Schwartz, M. (ed.) Chapman & Hall. New York, New York, 345-378.

Soil Conservation Service. 1979. Soil Survey of Bastrop County, Texas. In cooperation with the Texas Agricultural Experiment Station. Washington, D.C.

Soulé, M.E. 1987. Viable populations for conservation. Cambridge University Press. Cambridge, Massachusetts.

Soulé, M., A. Alberts, and D. Bolger. 1992. The effects of habitat fragmentation on chaparral plants and vertebrates. Oikos 63:39-47.

Suarez, A.V., D.T. Bolger, and T.J. Case. 1998. Effects of fragmentation and invasions on native ant communities in coastal southern California. Ecology 79: 2041-2056.

Texas Department of Transportation. 1993. Houston toad monitoring program SH 21 from the entrance of Bastrop State Park to FM 1441. Bastrop County, Texas.

Texas Parks and Wildlife Department. 1993. Endangered species information for Hilltop Lakes. Texas Parks and Wildlife Resource Protection Division, Austin, Texas.

TPWD. 2001. Threatened and Endangered Species: Houston Toad. http://www.tpwd.state.tx.us/nature/endang/animals/htoad.htm (September 16, 2002)

Texas Department of Water Resources. 1978. Land use/land cover maps of Texas. Compiled and interpreted by Glenn Outz. Funded by U.S. Environmental Protection Agency and reprinting funded by the U.S. Department of Housing and Urban Development through the Governor's Office of Budget and Planning. Austin, Texas.

Tschinkel, W. 1988. Distribution of two species of fire ants in north Florida in relation to habitat and disturbance. Ann. Entomol. Soc. Am. 81:76-81.

TSDC and CDSRE (Texas State Data Center and Center for Demographic and Socioeconomic Research and Education). 2001. Projections of the population of Texas and counties in Texas by age, sex, and race/ethnicity for 2000-2040. December 2001. Internet resource, http://txsdc.tamu.edu/tpepp/2001_txpopprj_cntytotnum.php

TWC (Texas Workforce Commission). 2001. Texas Workforce Commission, Texas counties. Last revised 20 December 2001. Internet resource, http://www.twc.state.tx.us/lmi/lfs/area/county/countyhome.html

TWDB (Texas Water Development Board). 2002. Population and water demand projections: TWDB (Texas Water Development Board). 2002. Population and water demand projections: board approved regional projections to be used in the 2002 state water plan.

Internet resources,
http://www.twdb.state.tx.us/data/popwaterdemand/popwaterdemandmain.htm

Welsh, H. 1990. Relictual amphibians and old-growth forests. Conservation Biology 14: 309-319.

USCB (U.S. Census Bureau). 1995. Population of counties by decennial census: 1900 to 1990. Internet resource, http://www.census.gov/population/cencounts/tx190090.txt

USCB (U.S. Census Bureau). 2002a. U.S Census Bureau, American factfinder. Internet resource, http://factfinder.census.gov/servlet/BasicFactsServlet

USCB (U.S. Census Bureau). 2002b. U.S. Census Bureau, state and county quickfacts. Internet resource, http://quickfacts.census.gov/qfd/

U.S. Fish and Wildlife Service (USFWS). 1984. Houston toad recovery plan. U.S. Fish and Wildlife Service. Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 2004. Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service. J. Allen White, USFWS Austin Fish and Wildlife Service Office. July 2004

USFWS. 1999. Houston toad recovery team meeting minutes. Austin, Texas.

USFWS. 1984. Navasota ladies'-tresses recovery plan. U.S. Fish and Wildlife Service. Albuquerque, New Mexico.

Van Gelder, J. 1973. A quantitative approach to mortality resulting from traffic in a population of *Bufo bufo*. Oecologica 13:93-95.

Vos, C.C. and J.P. Chardon. 1998. Effects of habitat fragmentation and road density on the distribution pattern of the moor frog *Rana arvalis*. Journal of Applied Ecology 35:44-56.

Yanes, M., J. Velasco, and F. Suarez. 1995. Permeability of roads and railways to vertebrates: the importance of culverts. Biological Conservation 71:217-222.

Yantis, J.H. 1989. Houston toad distribution and habitat status. Performance report, Job No. 76. Texas Parks and Wildlife Department. Austin, Texas.

Yantis, J.H. 1990. Houston toad distribution and habitat status. Performance report, Job No. 76. Texas Parks and Wildlife Department. Austin, Texas.

Yantis, J.H. 1991. Houston toad distribution and habitat status. Performance report, Job No. 76. Texas Parks and Wildlife Department. Austin, Texas.

Yantis, J.H. 1992a. Houston toad distribution and habitat status. Performance report, Job No. 78. Texas Parks and Wildlife Department. Austin, Texas.

Yantis, J.H. 1992b. Houston toad project: distribution search. May 23, 1992 memorandum from Jim Yantis to Andy Price, Texas Parks and Wildlife Department. Austin, Texas.

Yantis, J.H. 1994. Houston toad comments. December 10, 1994 memorandum from Jim Yantis, Texas Parks and Wildlife Department, to Lisa O'Donnell and Kathy Nemec, U.S. Fish and Wildlife Service. Austin, Texas.

Appendix A

Causation and Reasonable Certainty

1) Causation

The Act's regulations provide that assessment of a federal proposed action must consider the effects caused by that action, but do not provide guidance on the nature of causal inquiry to be conducted. The Act's case law concerning indirect effects and causation is rare, and little guidance has issued from the courts over the past 15 years. Older Act cases that addressed causation did not directly address what the test of causation should be or how it should be applied to complex factual situations of the type considered in the EA/HCP (see e.g., *National Wildlife Federation v. Coleman*, 529 F.2d 359 [5th Circuit], cert. denied, 429 U.S. 979 (1976) and *Riverside Irrigation District v. Andrews*, 758 F.2d 508 [10th Circuit 1985]).

Regulatory language that defines indirect impacts and incorporates the concept of causation under the Act is the same framework used under NEPA. In both cases, the causal test is established only by the phrase "indirect effects are caused by the action" (40 CFR 1508.8[b] and 50 CFR 402.02). NEPA and the Act thus appear to have the same test for causation. Under NEPA, recently issued judicial opinions have provided significant guidance on how to conduct causal analysis. These decisions address complex fact patterns comparable to the issues addressed in this section.

The Ninth Circuit has held that an effect is caused by an action if the action is an "indispensable prerequisite" or an "essential catalyst" to the effects. *City of Davis v. Coleman*, 521 F.2d 661, 674 (9th Circuit 1975). However, it is not enough that the actions might be related or that each "might benefit from the other's presence." *Sylvester v. U.S. Army Corps of Engineers*, 884 F.2d 394 (9th Circuit 1989). Similarly, it is not enough if a proposed action "may induce limited additional development" when "the existing development necessitated the [action]." *City of Carmel by-the-Sea v. DOT*, 123 F.3d 1142 (9th Circuit 1997). In *City of Carmel by-the-Sea v. DOT*, the Ninth Circuit upheld an analysis that stated that the proposed project "had the potential to facilitate growth" but would not ultimately do so because of the development constraints imposed by local authorities. Similarly, in a case involving an airport expansion project designed to address existing levels of air traffic, the Ninth Circuit rejected the argument that airport expansion removed a constraint to growth because without the project, growth could not occur safely. The Ninth Circuit stated, "the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact..." *Morongo Band of Mission Indians v. Federal Aviation Administration*, 161 F.3d 569 (9th Circuit 1998).

In a recent example of the application of the causal analysis to a complex fact pattern, the court in *Border Power Plant Working Group v. Dept. of Energy*, (2003 WL 21037927 [S.D. Cal.]), followed the analysis established by *Sylvester v. U.S. Army Corps of Engineers*, *City of Carmel by-the-Sea v. DOT*, and *Morongo Band of Mission Indians v. Federal Aviation Administration*. The court found that authorization of a power transmission line on the U.S./Mexico border did not require analysis of emissions from a Mexican power plant that could use the new line to transmit power to the U.S. The court held that the turbines in the plant dedicated to production of power

for Mexico were not causally linked to the new transmission line "in a way that makes the BPP line a necessary prerequisite or essential catalyst to their operation." The court also noted that "because the line of causation is too attenuated between these turbines and the federal action permitting the BPP line, Ninth Circuit authority makes clear that the emissions of the non-export turbines were not effects of the BPP line and that the federal defendants were therefore under no NEPA obligation to analyze their emissions as effects of the action." The court also found that because the turbine in the plant that was dedicated to the export of power had an alternate route, the BPP line could not be considered the but-for cause of the export turbine's operation and effects from the operation of the turbine were therefore not indirect effects of the BPP line.

Based on existing judicial guidance, relevant factors in the causal analysis concerning growth-inducement include whether the action is the sole cause, whether the action has a useful purpose other than serving new growth, whether the action is intended to induce growth or to address existing levels of demand, and whether growth is being regulated at the local level. The test embraced by the courts demonstrates a pragmatic approach that recognizes a stopping point must exist in any causal analysis.

2) Reasonable Certainty

If it is determined that a proposed action has the potential to cause indirect impacts, then an analysis must be conducted to determine whether any of the potential indirect impacts are reasonably certain to occur. Under the Act, use of the term "reasonably certain to occur" is narrower than the "reasonably foreseeable" standard used under NEPA. The term "reasonably certain to occur" was selected by the Service to eliminate speculation concerning future actions (51 FR 19926, 19933 [June 3, 1986]). In order for an action to be reasonably certain to occur, "there must exist more than a mere possibility that the action may proceed." (*Id.*) Factors to be considered to determine whether a proposed action is reasonably certain to occur include the economic, administrative, and legal hurdles remaining, as evidenced by work plans, appropriations, and pending or issued permits. (Endangered Species Consultation Handbook, p. 4-28, Service, 1998). According to the Service, "the more State, tribal or local administrative discretion remaining to be exercised before a proposed... action can proceed, the less there is reasonable certainty the project will be authorized." (*Id.* at p. 4-30).

Test of Causation and Reasonable Certainty in Connection with the Proposed Activities and Future Growth

For the Purposes of examining the issues of causation and reasonable certainty of occurrence with regard to the proposed activities and possibility of growth-related indirect impacts, the proposed activities of each of the four Utilities are reviewed briefly here again:

- AE operates and maintains above-ground electrical transmission lines that carry electricity outside of the permit area and do not provide local service.
- Aqua provides local water service and proposes to install, operate, repair, and/or maintain below-ground water lines, fixed foundation facilities, and water meters.

- BEC provides local electrical service through installation, operation, and/or maintenance of above-ground transmission and distribution lines.
- LCRA operates and maintains above-ground and below-ground utility (electric, water, and wastewater) lines, parklands, and fixed-foundation facilities related to its utilities and parklands. Most of the electricity carried by LCRA lines is transmitted outside the permit area, but the agency does provide some limited amount of local electric, water, and wastewater service. LCRA proposes to repair, maintain, upgrade, and/or operate existing facilities and to install new linear and fixed-foundation facilities.

Discussions of whether the proposed activities may cause indirect growth-related impacts outside or inside of the permit area within the framework established are provided below.

Indirect Growth-related Effects Outside the Permit Area

This issue centers on whether any of the proposed activities of the Utilities has a causal link to future growth outside of the permit area, and whether such growth is reasonably certain to occur.

All of the proposed activities of the Utilities would occur inside the permit area. Activities that would be performed by Aqua and BEC would occur only as a result of demand created from within the permit area. Therefore, no causal link appears to exist between the proposed activities of Aqua and BEC and potential future growth outside of the permit area.

With regard to AE and LCRA, authorization of the proposed activities would permit maintenance of transmission lines used by these two entities to carry electricity outside of the permit area and, in the case of LCRA, to upgrade these lines. This electricity is primarily used by residents of the greater Austin metropolitan area, but may also be used by residents elsewhere within the LCRA service area. Both AE and LCRA also generate electricity or purchase electricity generated in many other locations from outside of the permit area. All of this electricity is fed into a grid system along with that generated from within the permit area such that it is impossible for a utility provider to trace a particular electron from point of generation to its end use.

Growth in the greater Austin metropolitan area is considered reasonably certain to occur, with many approved residential subdivisions and commercial developments under construction or in the final planning stages. It is also reasonable to assume that AE or LCRA will provide electricity to many of these new developments. However, because AE and LCRA generate electricity or purchase electricity generated in many locations outside of the permit area, future growth outside of the permit area does not appear to be causally linked to the proposed activities because that growth can occur in absence of authorization of the proposed activities. Consequently, the proposed activities are not considered to have potential to result in indirect growth-related Effects outside of the permit area.

Indirect Growth-related Effects Inside the Permit Area

As discussed in Section 3.11 of the EA/HCP, the populations of Bastrop and Lee counties showed steady growth through the 1990s, and, due to the relative proximity of the City of Austin, this

growth is expected to continue through the 21st century. However, expectation of continued population growth does not necessarily make that growth "reasonably certain to occur" as interpreted under the Act or NEPA. Approved but as of yet un-built subdivisions within the permit area are considered to satisfy the definition of "reasonably certain to occur." Other anticipated growth may or may not actually be realized depending on future socioeconomic conditions, and how much of this anticipated growth should be considered "reasonably certain to occur" is an issue that is not resolved herein.

Answering the question of whether a causal link exists between future growth in the permit area and the proposed activities of the Utilities requires individual examination of the types of activities proposed to be performed. These activities can generally be separated into three distinct categories: (1) maintenance and/or repair of existing facilities; (2) installation and maintenance of facilities related to parklands; and (3) installation and subsequent maintenance of new utility lines and utility-related fixed-foundation facilities.

Maintenance and repair of existing facilities, which are proposed activities of all four Utilities, are not considered to have potential to result in any growth-related indirect impacts because the activities would not result in increased levels of utility service within the permit area. Similarly, installation and maintenance of parkland facilities are not considered to have potential to result in indirect growth-related indirect impacts because no causal link appears to exist between presence of parkland and future growth.

Installation and maintenance of new utility facilities would be required by any new residential or commercial development. Within the permit area, the Utilities respond to demands for service rather than constructing utilities with the hope of being able to sell service or create demand. Therefore, in general, providing utility service should not be interpreted as inducing growth, but instead as responding to that growth.

At the same time, the new facilities or upgraded existing facilities proposed by Aqua, BEC, and/or LCRA may be designed to carry greater capacity than that required by immediate demand in anticipation of increased future demand. Designing utility lines for future demand is more cost-effective in the long-term and allows the Utilities to provide the highest level of customer service while reducing direct and indirect impacts to the maximum extent practicable. However, designing utility lines to be capable of carrying anticipated future demand does create the question of whether that additional capacity ultimately can promote growth in a "build it and they will come" type of scenario or instead simply provides the Utilities with the ability to respond efficiently to increased demand in their service region.

Many landowners can and do choose to obtain water from wells rather than from Aqua. Permits to drill water wells can be obtained from the State of Texas without undergoing Act review. Failure by Aqua to provide water service in a particular area would not necessarily preclude development in that area, although it might result in less intensive development than could occur with Aqua water service.

In the permit area outside of the City of Bastrop, electrical utility service can only be provided by BEC or, in some limited areas, by LCRA. Therefore, development within the permit area outside of the City of Bastrop cannot occur without the electrical services provided by BEC and, to a lesser degree, LCRA, apart from any development that relied on electricity obtained from solar power, wind power, or gas-powered generators. Any such development would be expected to be of very low intensity.

While Aqua, BEC, and LCRA provide utilities only in response to requests for such service, a causal link may exist between any future development in the permit area and those utility services because that development could not occur, or could not occur at the same intensity, without those services. Therefore, a discussion of indirect growth-related impacts with potential to result from the Preferred Alternative is provided in the Biological Opinion, Section 6.2, Discussion of Potential Indirect Growth-related Effects.